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U.S. DEPARTMENT OF THE INTERIOR

OFFICE OF WATER RESEARCH AND TECHNOLOGY
WATER RESOURCES SCIENTIFIC INFORMATION CENTER

SELECTED WATER RESOURCES ABSTRACTS

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VOLUME 8, NUMBER 21
NOVEMBER 1, 1975

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SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 8, NUMBER 21
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W75-10351 -- W75-10850

The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, D. C. 20240

CONTENTS

FOREWORD iii

SUBJECT FIELDS AND GROUPS

(Use Edge Index on back cover to Locate Subject Fields and Indexes in the journal.)

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Non-Water Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

REMOVAL OF PERIODICITIES BY DIFFERENCING AND MONTHYL MEAN SUBTRACTION,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
M. L. Kavvas, and J. W. Delleur.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-243 916, $3.75 in paper copy, $2.25 in microfiche. (1974). 23 p, 4 fig, 5 ref. OWRT B-036-IND(4).

Descriptors: *Time series analysis, Stochastic processes, Time lag, Statistical methods, Hydrographs, Hydrologic aspects, Mathematical models, Seasonal, Monthly.
Identifiers: *Hydrological sequences, *Periodicity, ARMA models, Spectral density, Seasonal differencing, Non-seasonal differencing.

The spectral representation of periodic hydrologic time series has both a continuous and a discrete part which represent the periodic and stationary random components, respectively. With this representation, seasonal and non-seasonal differencing and manthly mean subtraction methods for the removal of the periodic component were analyzed for the case of monthly series. It is shown both analytically and by an exapmple that seasonal differencing removes and nonseasonal differencing effectively reduces the periodicity in the covariance function. However, both kinds of differencing greatly distort the original spectrum, wiping out the original spectral contribution at the origin and greatly reducing it near the origin. The fit to the distorted spectrum by ARMA models with few parameters is almost impossible and the fitted models are impractical for hydrologic simulation since they either yield an infinite variance or are undefined at the spectral origin. Subtraction of monthly means completely removes the periodicity in the covariance but introduces a different type of nonstationarity which is negligible for practical purposes.
W75-10352

LAND USE SIMULATION MODEL OF THE SUBALPINE CONIFEROUS FOREST ZONE,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 3B.
W75-10404

GEOMORPHIC PROCESSES IN POLAR DESERTS,
Arizona State Univ., Tempe. Dept. of Geology.
For primary bibliographic entry see Field 2C.
W75-10456

PROCEEDINGS SYMPOSIUM ON STATISTICAL HYDROLOGY.
Agricultural Research Service, Washington, D.C.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 - Price $3.70. Symposium held at Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publication No. 1275, U.S. Department of Agriculture, Washington, D.C., Agricultural Research Service, June 1974. 386 p.

Descriptors: *Conferences, *Hydrology, *Statistical models, *Model studies, *Stochastic processes, Statistics, Mathematical studies, Mathematical models, Statistical methods, Rainfall, Runoff, Sediment transport, Data processing, Reservoirs, Markov processes, Floods, Simulation analysis, Least squares method, Regression analysis, Precipitation(Atmospheric), Thunderstorms, Streamflow, Spatial distribution, Temporal distribution, Analytical techniques.

The symposium objective was to generate cooperation and facilitate discussions between hydrologists and statisticians on the application of probabilistic and statistical methodologies to hydrologic problems. General topics covered included preparation of stochastic models of rainfall, runoff, and sediment; estimation of extreme values; and optimization of hydrologic modeling techniques. (See also W75-10508 thru W75-10531) (Humphreys-ISWS)
W75-10507

SOME PROBLEMS IN PURE AND APPLIED STOCHASTIC HYDROLOGY,
Toronto Univ. (Ontario). Dept. of Mechanical Engineering; and Toronto Univ. (Ontario). Inst. of Environmental Sciences and Engineering.
V. Klemes.
In: Proceedings Symposium on Statistical Hydrology, Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publication No. 1275, p 2-15, June 1974. 8 fig, 1 tab, 19 ref.

Descriptors: *Hydrology, *Statistical models, *Runoff, *Reservoir storage, Storage, Statistics, Probability, Distribution, Frequency curves, Model studies, Reservoirs, Streamflow, Analytical techniques, Statistical methods, Stochastic processes.
Identifiers: *Distribution functions, Distribution models, Skewness.

Because the aim of pure hydrology is the understanding of the behavior of hydrologic phenomena, it is necessary that stochastic models of hydrologic processes be physically founded. Several examples were presented of how probabilistic description of the mechanism of runoff formation leads to physically justified runoff distribution models. For some applied purposes, the numerical values of parameters seem to be much more important than the forms of models, and the physical justifiability of a model seems to be irrelevant. However, a physically sound concept of a model can, at least to some extent, compensate for the inaccuracy of parameter estimates resulting from small sample sizes of available empirical data. This was illustrated by an example relating various runoff distribution models to stationary solution of the storage equation. Usefulness of stationary solution as a basis for optimization of a single storage reservoir was challenged and optimization on regional basis was advocated. (See also W75-10507) (Sims-ISWS)
W75-10508

MULTISITE STREAMFLOW SIMULATION OF TRUCKEE RIVER, NEVADA,
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 2E.
W75-10509

GENERAL ASPECTS OF MULTIVARIATE ANALYSIS WITH APPLICATIONS TO SOME PROBLEMS IN HYDROLOGY,
Agricultural Research Service, Chickasha, Okla.
D. G. DeCoursey, and R. B. Deal.
In: Proceedings Symposium on Statistical Hydrology, Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publication No. 1275, p 47-68, June 1974. 10 fig, 10 tab, 11 ref.

Descriptors: *Hydrology, *Regression analysis, *Correlation analysis, *Oklahoma, Mathematical studies, Runoff, Statistical methods, Rainfall, Data processing, Streamflow, Analytical techniques.
Identifiers: *Multivariate analysis, Discriminant analysis, Canonical regression.

Hydrologic data are collected at many sites throughout the world to provide estimates of rainfall, volumes of runoff, peak rates of flow, and other events. These events are caused by the interaction of such factors as the climatic sequences and the topographic and geologic features of the watersheds. The events themselves are also very highly related, that is, storm volumes and peak rates of flow. Therefore, the analysis of these data becomes a classic example of a multivariate problem in both the input and response characteristics. Twelve independent or causative variables and 37 dependent or hydrologic response characteristics from 90 runoff measuring sites in Oklahoma were analyzed. Conventional multiple regression, stepwise regression, and components regression were compared in the development of prediction equations. Several variations of components regression, some of which use factor analysis, were presented. A variation of the classical multiple discriminant analysis was used to find regions of similar hydrologic response. The regions for some hydrologic variables were geographically contiguous, whereas others were not. Classical canonical correlation was used to find sets of causative and response variables that are related. The concept was used as a base for showing that it is possible to develop prediction equations for various hydrologic characteristics that retain the observed intercorrelation of the hydrologic characteristics. The prediction equations were all based on the same set of independent variables. (See also W75-10507) (Sims-ISWS)
W75-10510

STATISTICAL TOLERANCE LIMITS FOR A PEARSON TYPE III DISTRIBUTION,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-10511

A MODEL OF STATISTICAL ERRORS IN ESTIMATING STREAMFLOW FROM CONTINUOUS-STAGE RECORDS,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 2E.
W75-10512

A PRECIPITATION DATA SIMULATOR USING A SECOND ORDER AUTOREGRESSIVE SCHEME,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 2B.
W75-10513

CROSS SPECTRA OF SHORT-DURATION RAINFALL,
Agricultural Research Service, Beltsville, Md. Hydrograph Lab.
For primary bibliographic entry see Field 2B.
W75-10514

HOURLY RAINFALL GENERATION FOR A NETWORK,
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 2B.
W75-10515

STOCHASTIC GENERATION OF THE OCCURRENCE, PATTERN, AND LOCATION OF MAXIMUM AMOUNT OF DAILY RAINFALL,
Agricultural Research Service, Chickasha, Okla.
For primary bibliographic entry see Field 2B.
W75-10516

COMMENTS ON THE STATISTICAL DISTRIBUTION OF RAINFALL PER PERIOD UNDER VARIOUS TRANSFORMATIONS,
Georgia Univ., Athens. Computer Center.
For primary bibliographic entry see Field 2B.
W75-10517

A STOCHASTIC MODEL FOR DAILY RAINFALL DATA SYNTHESIS,
Central and Southern Florida Flood Control District, West Palm Beach.
For primary bibliographic entry see Field 2B.
W75-10518

STOCHASTIC MODELS OF SPATIAL AND TEMPORAL DISTRIBUTION OF THUNDERSTORM RAINFALL,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
For primary bibliographic entry see Field 2B.
W75-10519

STOCHASTIC MODEL OF DAILY RAINFALL,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W75-10520

AN EVENT-BASED STOCHASTIC MODEL OF AREAL RAINFALL AND RUNOFF,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 2B.
W75-10521

RESEARCH IN STOCHASTIC MODELS FOR BEDLOAD TRANSPORT,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W75-10522

USE OF AUTOREGRESSIVE RUNOFF MODELS IN RESERVOIR STUDIES,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-10523

A STOCHASTIC MODEL OF SEDIMENT YIELD FOR EPHEMERAL STREAMS,
Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 2J.
W75-10524

STATISTICAL INFERENCE ON STREAMFLOW PROCESSES WITH MARKOVIAN CHARACTERISTICS,
Arizona Univ., Tucson. Dept. of Mathematics.
For primary bibliographic entry see Field 2E.
W75-10525

DISPERSION OF CONTAMINATED BEDLOAD PARTICLES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W75-10526

A NOTE ON MIXED DISTRIBUTIONS IN HYDROLOGY,
State Univ. of New York, Syracuse. Coll. of Environmental Science and Forestry.
For primary bibliographic entry see Field 2E.
W75-10527

DEVELOPING REGIONAL STOCHASTIC DATA BASES,
Iowa State Univ., Ames. Dept. of Economics.
For primary bibliographic entry see Field 2E.
W75-10528

STATISTICAL MODEL OF SHORT-DURATION PRECIPITATION EVENTS,
Iowa State Univ., Ames. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W75-10529

RECURRENCE INTERVALS OF ANNUAL MINIMUM STREAMFLOWS,
Keystone Junior Coll., LaPlume, Pa. Dept. of Mathematics.
For primary bibliographic entry see Field 2E.
W75-10530

A TWO-DISTRIBUTION METHOD FOR FITTING MIXED DISTRIBUTIONS IN HYDROLOGY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2E.
W75-10531

PHYSICAL MODEL STUDY OF CIRCULATION PATTERNS IN LAKE ONTARIO,
State Univ. of New York, Buffalo. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2H.
W75-10537

PEDOLOGIC COVER OF THE WATERSHED OF THE PORECKA RIVER,
Institute for Soil Research, Belgrade (Yugoslavia).
D. M. Tanasijevic.
Available from the National Technical Information Service, Springfield, Va 22161 as TT 73-56020, $4.25 in paper copy, $2.25 in microfiche. TT 73-56020, Report 1974. 62 p, 10 fig, 30 tab, 22 ref, 1 map. Translated from Pedoloski Pokrivac Sliva Porecke Reke, 1970.

Descriptors: *Soils, *Watersheds(Basins), *Pedocals, *Foreign countries, *Soil investigations, Climates, Vegetation, Data collections, Land use, Soil texture, Soil chemical properties, Soil physical properties, Brown soils, Acidic soils, Leaching, Chemical analysis, Alluvium, Productivity, Forests, Topography.
Identifiers: *Yugoslavia(Porecka River).

The Porecka River watershed comprises a narrow region in northeastern Serbia. It follows the dislocation line of the Porecka River and its tributaries, the Crnajka and Saska. The trapezoidal watershed of about 60,000 ha runs north-south and is divided into a narrow area of river terraces, stream banks, and dry gulches, and then hillocks, hummocks, hills, heights, and mountain peaks, which together with the other pedogenetic factors influenced the composition, development, and condition of the soils. Data was presented on geological composition, climate, vegetation, hydrography, and physical-chemical properties of the watershed soils. It was concluded that: (1) the pedological cover of the watershed is very heterogeneous, both in the types, sub-types, and varieties of soil, and in all other physical-chemical properties; (2) all soil formations are pre-eminently subject to processes of acidification and leaching; (3) deforested areas, especially cultivated areas, except riverside alluvial flats, are subject to erosion processes; (4) all the soils have more or less low economic-productive potential for intensive agricultural exploitation; (5) from the standpoint of exploitation, the total area of the watershed is naturally predetermined for pasture-meadow and forest production, except insignificant tracts along river courses that may be employed for crop-farming; (6) certain soils may in part be used for plantations; and (7) the primary task is to preserve developed soils by nuturing the grass-forest cover and attenuation of erosion processes. (Humphreys-ISWS)
W75-10551

WAVE CLIMATE MODEL OF THE MID-ATLANTIC SHELF AND SHORELINE (VIRGINIAN SEA), MODEL DEVELOPMENT, SHELF GEOMORPHOLOGY, AND PRELIMINARY RESULTS,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 2L.
W75-10552

PROGRESS IN AUSTRALIAN HYDROLOGY 1965-1974.
Compiled by the Australian National Commission for UNESCO. Australian Government Publishing Service, Canberra, 1974. 103 p.

Descriptors: *Hydrology, *Australia, *Research and development, *Reviews, Evaporation, Watersheds(Basins), Flood forecasting, Cloud seeding, Rivers, Groundwater, Water treatment, Hydrologic data, Legal aspects, Training.

Twenty-one articles by specialist authors are presented with an introduction briefly describing, as background, the Australian environment in relation to water resources. Each article provides an introductory review of a selected topic, emphasizing recent advances made in Australian studies. The topics include: rainfall modification; evaporation; catchment studies, flood forecasting and river morphology; groundwater exploration, development and conjunctive use; water treatment; data collection, handling and mapping; water planning, law and administration; and training in hydrology. (CSIRO)
W75-10646

NEW CONCEPTS IN SUBURBAN DRAINAGE IN FLORIDA,
Diaz, Seckinger and Associates, Inc., Tampa, Fla.
For primary bibliographic entry see Field 4A.
W75-10793

2B. Precipitation

OPERATIONAL VALUE OF WEATHER INFORMATION IN RELATION TO SOIL MANAGEMENT CHARACTERISTICS,
Purdue Univ., Lafayette, Ind. Agricultural Experiment Station.
For primary bibliographic entry see Field 2G.
W75-10367

SOME ASPECTS OF CLIMATOLOGY IN POLAR BARRENS,
Calgary Univ., Alberta. Dept. of Geography.
For primary bibliographic entry see Field 2C.
W75-10454

A CLIMATOLOGICAL ANALYSIS OF NORTH POLAR DESERT AREAS,
Colorado Univ., Boulder. Dept. of Geography; and Colorado Univ., Boulder. Inst. of Arctic and Alpine Research.
For primary bibliographic entry see Field 2C.
W75-10455

A PRECIPITATION DATA SIMULATOR USING A SECOND ORDER AUTOREGRESSIVE SCHEME,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
E. H. Wiser.
In: Proceedings Symposium on Statistical Hydrology, Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publication No 1275, p 120-134, June 1974. 10 fig, 5 tab, 5 ref.

Descriptors: *Precipitation(Atmospheric), *Rainfall disposition, *North Carolina, *Model studies, *Simulation analysis, Spatial distribution, Analytical techniques, Rainfall, Regression analysis, Statistical models, Simulated rainfall, Watersheds(Basins), Hydrology, Meteorology.
Identifiers: *Swannanoa River, Autoregression analysis.

It was assumed that for fixed weather conditions, the negative binomial distribution can be used to fit the observed distribution of precipitation amounts. Varying weather conditions were then interpreted as changing the values of the parameter of the distribution. Weather conditions vary in a quasi-oscillatory manner which may be described by a second-order autoregressive scheme (SOARS). The SOARS was used to generate a 'Storminess' parameter, which varies through time in the desired manner. Rate and direction of weather movement were also simulated to produce simultaneous values of the parameter at as many points as required. These values were converted by functions for each point into the parameters of the negative binomial distribution from which point rainfall amounts were obtained at each point. Use of the simulator was demonstrated with data for several North Carolina stations, and the process of fitting the parameters was described. (See also W75-10507) (Sims-ISWS)
W75-10513

CROSS SPECTRA OF SHORT-DURATION RAINFALL,
Agricultural Research Service, Beltsville, Md. Hydrograph Lab.
D. M. Hershfield, and B. Levy.
In: Proceedings Symposium on Statistical Hydrology, Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publication No 1275, p 135-146, June 1974. 17 fig, 1 ref.

Descriptors: *Rainfall, *Watersheds(Basins), *Variability, Distribution patterns, Correlation analysis, Frequency, Meteorology, Hydrology, Time series analysis, Statistical methods.
Identifiers: *Cross-spectral analysis, Short-duration rainfall, Power spectra.

To examine the relative direction of the incremental movements of rainfall during major storms, cross-spectral analysis was performed on time series composed of 15-minute increments from one major storm for three nearby stations at each of three different watersheds. A similar analysis was performed with data from a fourth watershed by using a 2-year series of daily data. The daily data appear to occur randomly with time whereas the 15-minute spectra all show considerable persistence as measured by the large amount of variance that is explained by the lower frequencies. When rainfall is associated with thunderstorm activity, as in the Cherokee, Oklahoma, example, there are only small differences in rainfall characteristics at the three stations which are separated by less than one-quarter of a mile. Similar results were obtained for nonthunderstorm rainfall when the gage separation is about two miles. Considerably more experimentation has to be performed with storms of long duration and increments of various lengths in order to determine the relative movement of rainfall with time. (See also W75-10507) (Sims-ISWS)
W75-10514

HOURLY RAINFALL GENERATION FOR A NETWORK,
Hydrocomp, Inc., Palo Alto, Calif.
D. D. Franz.
In: Proceedings Symposium on Statistical Hydrology, Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publication No 1275, p 147-153, June 1974. 15 ref.

Descriptors: *Rainfall, *Model studies, *Networks, Statistical models, Markov processes, Stochastic processes, Probability, Mathematics, Precipitation(Atmospheric), Urban hydrology, Streamflow, Hydrology, Distribution patterns, Rainfall disposition.
Identifiers: *Hourly.

Generation of synthetic, hourly rainfall data for a network of stations was investigated because existing monthly streamflow models are inadequate for many purposes and because watershed models are available to accurately predict streamflow given the hourly rainfall on the watershed. The use of synthetic rainfall with a watershed model should give more detailed traces of synthetic streamflow than the monthly total flows obtained from currently available stochastic streamflow models. The storm model is based on the multivariate normal distribution. Persistence is incorportated in the model by including the rainfall in the current and previous hours as variables. A fractional power tranformation is used to transform the observed distribution to normal at each station. The finite probability of zero rainfall is simulated by setting all values below a predetermined cutoff to zero before computing the inverse transformation in the generating process. The estimation of the storm model parameters is complicated by the presence of zeros in the data. Nonlinear least squares is used to estimate the transformation constant as well as the mean and variance of the tranformed data at each station in each of four seasons. The covariance matrix for the transformed variables is estimated by applying the relation between bivariate normal variates to the conditional cumulative distribution function of each pair of variables. The interstorm model consists of empirically defined distributions of interstorm length for 50 period in a year to closely approximate the annual variation of interstorm characteristics. (See also W75-10507) (Sims-ISWS)
W75-10515

STOCHASTIC GENERATION OF THE OCCURRENCE, PATTERN, AND LOCATION OF MAXIMUM AMOUNT OF DAILY RAINFALL,
Agricultural Research Service, Chickasha, Okla.
A. D. Nicks.
In: Proceedings Symposium on Statistical Hydrology, Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publication No 1275, p 154-171, June 1974. 9 fig, 10 tab, 12 ref.

Descriptors: *Rainfall, *Model studies, *Stochastic processes, *Oklahoma, Markov processes, Average, Probable maximum precipitation, Probability, Mathematics, Precipitation(Atmospheric), Networks, Distribution patterns, Rainfall disposition, Watersheds(Basins), Hydrology, Meteorology.
Identifiers: Daily.

A four-stage stochastic generation technique was used to synthesize the daily rainfall for a 1500-square-mile area in central Oklahoma. Synthetic records of up to 9 years were generated at 168 locations of an existing raingage network. Spatial patterns of rainfall for input to a hydrologic model were constructed by stochastically generating: (1) the occurrence or nonoccurrence of rainfall on each day, (2) the location of the central or maximum amount within the area, (3) the maximum amount, and (4) the pattern rainfall over the 1500-square-mile area corresponding to the central amount. Tests were presented for the representativeness and consistency of generated data including means, extremes, and frequency of occurrence in both time and spatial distribution. (See also W75-10507) (Sims-ISWS)
W75-10516

COMMENTS ON THE STATISTICAL DISTRIBUTION OF RAINFALL PER PERIOD UNDER VARIOUS TRANSFORMATIONS,
Georgia Univ., Athens. Computer Center.
P. M. Skees, and L. R. Shenton.
In: Proceedings Symposium on Statistical Hydrology, Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publication No 1275, p 172-196, June 1974. 4 fig, 13 tab, 51 ref. US DOD IPR-19-8-8001.

Descriptors: *Rainfall, *Distribution patterns, *Frequency curves, *Frequency analysis, Statistics, Temporal distribution, Statistical methods, Precipitation(Atmospheric), Climatology, Meteorology, Storms.
Identifiers: *Gamma distributions, *Transformations, Skewness, Kurtosis, Weekly, Daily, Hourly.

The statistical distribution of rainfall amounts over relatively long periods (months, years) has received considerable attention in the literature; generally, satisfactory fits are achieved for selected locations and seasons by using well known models such as the gamma, logarithmic normal, and normal distributions. For moderate to small intervals of observations (weeks, days, hours), satisfactory distributional models are much more difficult to find, although more observations are available. Considerable skewness in rainfall distributions arises because of the relatively numerous occurrences of 'no-rain' days; if these are omitted, one source of heterogeneity is removed. Amounts of rainfall on 'wet' days can still, over short periods, be very skewed, and over 100 transformations designed to eliminate this lack of symmetry were considered. About 30 locations in the southeastern United States were studied, and periods of observations were days, hours, and 'storms' periods. In most cases, the total number of observations involved were those included in 10-year records for 1955-1964. The models tried were the gamma, censored gamma, and generalized gamma distributions. Because considerable data analysis was involved, simple criteria were used for accepting or rejecting models. For example, moment methods of estimation and sample values of the skewness and kurtosis were used to judge departures from the gamma and normal distributions. (See also W75-10507) (Sims-ISWS)
W75-10517

A STOCHASTIC MODEL FOR DAILY RAINFALL DATA SYNTHESIS,
Central and Southern Florida Flood Control District, West Palm Beach.
N. N. Khanal, and R. L. Hamrick.
In: Proceedings Symposium on Statistical Hydrology, Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publication No 1275, p 197-210, June 1974. 4 fig, 12 tab, 10 ref, 1 append.

Descriptors: *Rainfall, *Synthesis, *Model studies, *Stochastic processes, Markov processes, Mathematical models, Climatology, Simulation analysis, Probability, Statistics, Temporal distribution, Statistical models, Statistical methods, Meteorology.
Identifiers: *Markov chain model, Daily.

A simple mathematical model was set up to synthesize daily rainfall values observed at a point. The synthesized daily rainfall values should be suitable for use in the Watershed Systems Model prepared in-house by the Flood Control District engineers. A first-order Markov Chain Model was proposed to do this. Statistical comparison was made between the historical and the synthesized daily rainfall values and they fit fairly well. (See also W75-10507) (Sims-ISWS)
W75-10518

STOCHASTIC MODELS OF SPATIAL AND TEMPORAL DISTRIBUTION OF THUNDERSTORM RAINFALL,
Agricultural Research Service, Tucson, Ariz. Southwest Watershed Research Center.
H. B. Osborn, L. J. Lane, and R. S. Kagan.

In: Proceedings Symposium on Statistical Hydrology, Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publication No 1275, p 211-231, June 1974. 7 fig, 1 tab, 22 ref, 1 append.

Descriptors: *Rainfall, *Thunderstorms, *Model studies, *Southwest U.S., *Arizona, Statistical models, Stochastic processes, *Spatial distribution, *Temporal distribution, Water sheds(Basins), Networks, Synthesis, Simulation analysis, Mathematical models.
Identifiers: *Walnut Gulch Watershed(Ariz).

A simplified stochastic model based on air mass thunderstorm rainfall data from the 58-square-mile Walnut Gulch Experimental Watershed in southeastern Arizona is being developed at the Southwest Watershed Research Center, Tucson, Arizona. Records from the 95 raingage network on this watershed provide valuable information on air mass thunderstorm rainfall in the southwestern United States. Probability distributions are being used to model random variables - number of cells, spatial distribution of the cells, and cell center depths - of thunderstorms in a summer rainy season. A computer program produces synthetic thunderstorm rainfall based on these distributional assumptions. The synthetic data are compared, with respect to storm center depths and isohyetal map characteristics, with data from the dense raingage network on Walnut Gulch. The daily and hourly chances of occurrence of seasonal air mass thunderstorm rainfall are modeled. Efforts are being made to model the temporal distribution of rainfall from individual cells within the air mass thunderstorm. Finally, the question of model transferability to other regions and locations is tied to defining regional meteorology and local topography. (See also W75-10507) (Sims-ISWS)
W75-10519

STOCHASTIC MODEL OF DAILY RAINFALL,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
V. Todorovic, and D. Woolhiser.
In: Proceedings Symposium on Statistical Hydrology, Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publication No 1275, p 232-246, June 1974. 6 fig, 1 tab, 5 ref, 2 append.

Descriptors: *Rainfall, *Stochastic processes, *Model studies, Markov processes, Temporal distribution, Statistics, Statistical models, Computer programs, Precipitation(Atmospheric).
Identifiers: *Markov chain model, Daily, Central limit theorem.

An application of stochastic processes for description and analysis of daily values of precipitation was presented. The total amount of precipitation S(n) during an n-day period is a discrete parameter stochastic process such that S(n) is greater than or equal to 0 and S(n + 1) is greater than or equal to S(n). The most general form of the distribution function, mathmatical expectation, and variance of S(n) were determined. The following special cases for the sequence of daily rainfall occurrences were considered: (1) sequence of independent identically distributed random variables, (2) sequence of independent random variables, and (3) markov chain. In addition, assuming that certain regularity conditions hold, it was proved that S(n) is asymptotically normal. The first passage time of S(n) and the corresponding distribution function were also considered. Numerical examples for cases 1 and 3 were presented, assuming that the daily rainfall amounts are exponentially distributed. The computer program for the Markov chain model was presented in an appendix. (See also W75-10507) (Sims-ISWS)
W75-10520

AN EVENT-BASED STOCHASTIC MODEL OF AREAL RAINFALL AND RUNOFF,
Arizona Univ., Tucson. Dept. of Watershed Management.
M. M. Fogel, L. Duckstein, and J. L. Sanders.
In: Proceedings Symposium on Statistical Hydrology, Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publicantion No 1275, p 247-261, June 1974. 8 fig, 1 tab, 16 ref. OWRT A-020-ARIZ(10).

Descriptors: *Rainfall, *Runoff, *Model studies, *Stochastic processes, Areal, Statistical models, Probability, Frequency curves, Rainfall-runoff relationships, Precipitation(Atmospheric), Meteorology, Hydrology.
Identifiers: Point rainfall.

A stochastic model of rainfall was developed to obtain runoff sequences on watersheds where the maximum events are most likely to be the result of thunderstorms. Runoff-producing rainfall events for a watershed were defined as a function of minimum levels of point measurements. The causal factors of a point measurement, given the occurrence of an event over a watershed, were the magnitude, location, and pattern of that areal event. It was found that the probability distribution function of point rainfall is geometric. Random variables representing precipitation at several points were then convoluted to yield mean areal values of rainfall whose distribution is negative binomial. Chicago and New Orleans data seem to validate the model developed in Tucson. A table describing seasonal rainfall combinations was used to generate possible annual sets of events. Corresponding likely sets of runoff amounts were then obtained by using both a simple linear rainfall-runoff relationship and the Soil Conservation Service formula for estimating runoff. A study of the frequency distribution of annual number and duration of runoff events with the use of an independent set of data provided a further validation of the proposed model. (See also W75-10507) (Sims-ISWS)
W75-10521

STATISTICAL MODEL OF SHORT-DURATION PRECIPITATION EVENTS,
Iowa State Univ., Ames. Dept. of Civil Engineering.
T. A. Austin, and B. J. Claborn.
In: Proceedings Symposium on Statistical Hydrology, Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publication No 1275, p 356-365, June 1974. 4 fig, 7 tab, 7 ref.

Descriptors: *Precipitation(Atmospheric), *Mathematical models, *Rainfall, *Texas, Runoff, Rainfall-runoff relationships, Monte Carlo method, Simulation analysis, Model studies, Storms, Meteorology, Climatology, Hydrology.
Identifiers: *Lubbock(Tex), Short-duration precipitation.

A mathematical model of short-duration precipitation events was presented. The model assumed these short-duration events were random in nature and could be described by a set of stationary probability distribution functions. The model described the storm depth, duration, and the time interval since the occurrence of the last storm event. In addition, a procedure for distributing the rainfall depth during the storm was proposed. The model is useful in providing stochastic inputs to rainfall-runoff models in order to evaluate the runoff from a variety of storm and antecedent conditions. Data from Lubbock, Texas were used to calibrate and verify the model. The means and standard deviations of the generated sequences were statistically indistinguishable from the means and standard deviation of the historical data. (See also W75-10507) (Sims-ISWS)
W75-10529

ERROR ANALYSIS OF DOBSON SPECTROPHOTOMETER MEASUREMENTS OF THE TOTAL ATMOSPHERIC OZONE CONTENT,
National Aeronautics and Space Administration, Wallops Island, Va. Wallops Station.
For primary bibliographic entry see Field 7B.
W75-10545

ANALOG TEMPERATURE RECORDS FROM A LINEARIZED THERMISTOR NETWORK,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 7B.
W75-10650

ENVIRONMENTAL PROBLEMS ASSOCIATED WITH THE USE OF COOLING TOWERS,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 5D.
W75-10671

PRIORITY PROBLEMS FOR MODIFYING CUMULUS PRECIPITATION,
Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
For primary bibliographic entry see Field 3B.
W75-10774

2C. Snow, Ice, and Frost

WATERSHED MANAGEMENT IN THE ROCKY MOUNTAIN SUBALPINE ZONE: THE STATUS OF OUR KNOWLEDGE,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 3B.
W75-10405

SOME ASPECTS OF CLIMATOLOGY IN POLAR BARRENS,
Calgary Univ., Alberta. Dept. of Geography.
M. B. Giovinetto.
In: Polar Deserts and Modern Man. T. L. Smiley and J. H. Zumberge, eds. University of Arizona Press, Tucson, p 3-22, 1974. 17 fig, 8 tab, 62 ref.

Descriptors: *Arctic, Antarctic, *Glaciology, *Arid climates, *Semiarid climates, Fourier analysis, Surface melt runoff, Attenuation, Precipitation, Solar radiation, Advection, Snow cover, Albedo, Cloud cover, Water vapor, Wind velocity, Percolation, Condensation.
Identifiers: Sachs Harbor.

The following climatic characteristics of ice-free barrens are discussed: (1) the attenuation of winter air-temperatures and (2) the relatively small variability of annual precipitation. Surface heat in high latitude barren areas is described. An harmonic analysis of air temperature for stations in the Arctic and Antarctic is made comparing the warmest and coldest months as influenced by snow albedo, surface melt runoff and subsurface temperatures. Variations of potential insolation explain the trend of increasing temperature amplitude ratios with increasing latitude; amplitude ratios are smaller in the Arctic than the Antarctic at a given latitude. Poleward from the subtropics, and for regular increments in latitudes, the decrease of the incoming radiation rate is greater than that of the outgoing radiation rate. At 70 degrees latitude, atmospheric sensible heat transport - by meridional circulations and eddy fluxes - is an order of magnitude greater than the contributions of latent heat flux and oceanic energy fluxes. Cloud cover as related to upper air and surface inversions is discussed. Precipitation and accumulation in ice free barrens are determined using glaciological data from adjacent glaciated areas. (Michael-Arizona)
W75-10454

A CLIMATOLOGICAL ANALYSIS OF NORTH POLAR DESERT AREAS,
Colorado Univ., Boulder. Dept. of Geography; and Colorado Univ., Boulder. Inst. of Arctic and Alpine Research.
M. J. Bovis, and R. G. Barry.
In: Polar Deserts and Modern Man, T. L. Smiley and J. H. Zumberge, eds. University of Arizona Press, Tucson, p 23-31, 1974. 4 fig, 7 tab, 21 ref.

Descriptors: *Arctic, *Temperature, *Precipitation, *Evaporation, *Runoff, *Percolation, Cloud cover, Isotherm radiation, Albedo, Permafrost, Arid climates, Semiarid climates, Polar regions.
Identifiers: *Polar deserts.

Means of estimating moisture balance in the Arctic are examined. The limits of polar desert as defined by soil and vegetation criteria are statistically tested with reference to climatic data. At 48 Arctic stations the following variables were determined (1) mean annual temperature; (2) mean July temperature; (3) annual temperature range; (4) mean annual precipitation; (5) mean number of days with precipitation per annum; (6) summer precipitation (June, July and August); and (7) mean cloud cover. Resulting figures indicate that deserts and non deserts may be statistically separated when a discriminant function is used with the given input variables. Four methods of estimating annual evaporation are presented of which three included a mean annual net radiation term. Factors utilized to compute evaporation include solar radiation, annual runoff, annual precipitation, percolation losses, oceanicity, and saturation. The distribution of world deserts and semideserts are shown according to the Budyko rational index of dryness, the Thornwaite-Mather moisture index, and the Turc evaporation formula. (Michael-Arizona)
W75-10455

GEOMORPHIC PROCESSES IN POLAR DESERTS,
Arizona State Univ., Tempe. Dept. of Geology.
T. L. Pewe.
In: Polar Deserts and Modern Man, T. L. Smiley and J. H. Zumberge, eds., University of Arizona Press, Tucson, p 33-52, 1974. 20 fig, 63 ref.

Descriptors: *Permafrost, *Geothermal studies, *Frozen ground, *Snow, Engineering structures, Construction, Saline soil, Alaska, Canada, Antarctica, Air temperature, Runoff, Quaternary period, Vegetation, Radioactive dating, Solifluction, Surface drainage, Alluvial fans, Ephemeral streams, Dunes, *Polar regions.

The differences between polar deserts, (defined as glacier-free terrestrial areas where mean annual precipitation is less than 25 cm and the mean temperature for the warmest month of the year is less than 10C.) and temperate-tropic deserts are discussed in relation to the differences in geomorphic processes. Differences are (1) cold versus hot environments, (2) precipitation in solid rather than liquid form, (3) precipitation concentrated in annual spring runoff in the cold desert, and (4) most soil moisture in the polar desert is in the solid state as ice. The limitation of man's activities in polar desert areas is attributed to the presence of permafrost. This layer of permafrost, can increase in thickness annually. Its distribution is affected by snow, vegetation cover, topography, and bodies of water. The content of ground ice in permafrost greatly affects human life in the North and provides evidence concerning past climates beyond the range possible by geothermal calculations. The causes and formation of ice wedges are described, some wedges dated by radiocarbon analysis appear to be from 3,000 to 32,000 years old. Geomorphic features related to permafrost include soil flowage, surface microrelief patterns which cause beaded drainage patterns, and uneven land formation. Features common to polar and temperate-tropic deserts include sand dunes, ventifacts and taffoni. Modern man's adaptation attempts to accommodate polar desert conditions are discussed, including the difficulties encountered in construction engineering. (Michael-Arizona)
W75-10456

GEOLOGICAL AND LIMNOLOGICAL FACTORS OF COLD DESERTS,
Geological Survey, Reston, Va.
W. E. Davies.
In: Polar Deserts and Modern Man, T. L. Smiley and J. H. Zumberge, eds., University of Arizona Press, Tucson, p 53-61, 1974. 7 fig, 20 ref.

Descriptors: Hydrology, *Limnology, *Ice cover, *Snow, *Glaciers, *Deserts, Melting, Underflow, Surface drainage, Ice, Arctic, Rivers, Turbidity, *Water quality, Heat budget, Lake ice, Salinity, Silts, Snow fall, Leaching, Seawater, Currents(Water), Permafrost, Evaporation, Ablation, Meltwater, Sodium, Magnesium, Calcium chloride, Calcium sulfate, Sodium chloride, Calcium carbonate, Stratification, Polar regions.

The phenomenon of the hydrologic regimen in the Arctic deserts with permanent freshwater lakes and large well-developed river basins but with precipitation less than 6 cm annually is discussed. In the High Arctic the major sources for runoff are melt of glacier ice and melt of ground ice. Lag runoff from accumulation of winter snow is a major source of water in small stream basins that are independent of glaciers. Large streams in the northern cold deserts are supplied by runoff from melting glaciers. During the twentieth century, this source of water has been operating at a deficit, with more runoff than accumulation, resulting in some dramatic changes in glaciers and in the margins of ice sheets. Polar lakes are classified in three divisions; lakes with large quantities of material suspended in water, frequently supporting perennial ice; lakes containing clear water, most of which are fed by snow melt and are clear of ice in July and August and which, in areas where aridity is maximum, have a high salt content which increases with evaporation and proximity to marine salt terraces; and shallow lakes occupying elongated basins where erosion occurs during melt periods due to wind-generated wave and current action. Ice free land within the cold desert of Antarctica occurs in relatively small regions. Ablation is high in these areas, precipitation amounting to 6 to 12 cm annually, most in the form of snow. Most lakes in the dry valleys of this region are saline. (Michael-Arizona)
W75-10457

SOILS OF THE HIGH ARCTIC LANDSCAPES,
Rutgers - the State Univ., New Brunswick, N.J.
J. C. F. Tedrow.
In: Polar Deserts and Modern Man, T. L. Smiley and J. H. Zumberge, eds. University of Arizona Press, Tucson, p 63-69, 1974. 11 fig, 1 tab, 36 ref.

Descriptors: *Polar regions, *Soils, *Soil classification, *Soil physical properties, *Antarctic, *Arctic, Sierozems, Tundra, Streams, Sands, Silts, Saline soils, Frozen soils, Frost action, Erosion, Soil erosion, Thawing, Meltwater, Bogs, Floodplain, Solifluction.
Identifiers: Subpolar, Desert pavement, Hummocky ground, Rockland.

Major genetic soils within the polar zone are discussed. Polar desert soils have a desert pavement surface with free, almost xeric drainage. This soil is usually neutral but commonly alkaline in reaction. Hummocky-ground soils, influenced in size and shape by erosion, contain a mixture of humic substances and organic material, and frequently are mineral-stained. Polar desert-tundra interjacence soils have a superabundance of moisture during the spring and early summer thaw period. During the dry season, the soils become hard, with salts efflorescing on the surface. Tundra soils are usually mildly acid, but sometimes alkaline when the low-lying tundra soils dry out. Soil distribution is influenced by textural composition; loams and silts are present in low-lying areas; and rockland, frost shattered areas, rocky talus slopes, floodplains and gravel bars are present throughout the High Arctic. On steep slopes, solifluction processes have obliterated or deformed many of the genetic soil features. Antarctic soils are classified as (1) ahumic soils, (2) evaporite soils, (3) protoranker, and (4) ornithogenic. (Michael-Arizona)
W75-10458

APPLICATION OF LOW-LATITUDE MICROBIAL ECOLOGY TO HIGH-LATITUDE DESERTS,
Jet Propulsion Lab., Pasadena, Calif.
R. E. Cameron.
In: Polar Deserts and Modern Man, T. L. Smiley and J. H. Zumberge, eds., University of Arizona Press, Tucson, p 71-90, 1974. 21 fig, 8 tab, 65 ref.

Descriptors: *Polar regions, *Soil microbiology, Ecology, Soil texture, Chemical properties, Physical properties, Chemical reactions, Latitudinal studies, Antarctic, Laboratory analyses, Environment, Biology, Chemical analysis.

Field techniques and laboratory analyses in the study of desert microbial ecology are described. Environmental and ecological features, as well as biotic factors and previous data collected are important in the selection of sampling sites. Aerobiological monitoring is used to make comparisons between distributions, abundances, and kinds of aerial propagules and soil microbiota. Methods to determine soil physical and chemical properties are described and results obtained on world arid-zone soils are presented. Properties described include texture, color, moisture content, redox potential and pH, electrical conductivity, cation and anion content, organic carbon content, organic nitrogen, cation exchange capacity, buffer capacity, moisture constants and thermoluminescence. Lower cation exchange and buffer capacity exist in the polar desert soils. Electrical conductivity varied depending upon the quantity and nature of salts in the soil. Abundances and types of microbes in arid-zone soils and their metabolic activity are described. Aerobic and microaerophilic bacteria are in highest abundance in desert regions, but the Antarctic polar desert has the fewest recoverable numbers of microorganisms. The Antarctic desert can be used to study soil microbial ecology at its least complex level in terms of gradients of the physical and chemical environment of the soil, terrain and microclimate at increasing latitude and altitude. Gradients range from uninhabitable to increasingly favorable environments; these conditions are summarized. The hygrothermal regime is the most important factor. (Garrettson-Arizona)
W75-10459

PROCESSES AND COSTS IMPOSED BY ENVIRONMENTAL STRESS,
Alaska Univ., College. Inst. of Social, Economic, and Government Research.
A. R. Tussing.
In: Polar Deserts and Modern Man, T. L. Smiley and J. H. Zumberge, eds., University of Arizona Press, Tucson, p 105-113, 1974. 6 tab, 51 ref.

Descriptors: *Polar regions, *Temperatures, *Ice fog, *Ice, *Freezing, Biology, Productivity, Economics, Mining, Arctic, Costs, Transportation, Pipeline, Oil, Gas, Fossil fuels, Alaska.

The stress imposed by man's works upon the polar environment and the stress imposed by the environment upon human activity are reported. Biotic productivity on land and in both fresh and salt water tends to be low causing the plant and animal resource potential to be of little significance commercially. The greatest cost for economic development has been expenditures for

construction, mineral exploration, transportation, and human habitation. The polar region is increasingly seen as a natural asset to non-Arctic man, and alteration of its wilderness status as constituting a cost to humanity. The cost of living index indicates rental costs for a moderate income family in Anchorage were 213 percent of the U.S. urban average. The formation of 'ice-fog' at temperatures below -30 deg C. forces man to consume more primary energy and invest in greater amounts of heating materials. Another powerful influence on costs is the fact that polar regions are being developed with equipment, building methods, and materials largely developed for radically different environments. Man-hour physical productivity is widely reported to be lower in Arctic and Sub-Arctic environments. The loss of man's effectiveness under conditions of dry cold with no wind was negligible down to about -18 deg C; performance fell to nearly zero at about -34 deg C. (Garrettson-Arizona)
W75-10461

REVIEW OF DEVELOPMENT OF ARCTIC RESOURCES,
Arctic Inst. of North America, Montreal (Quebec).
J. C. Reed.
In: Polar Deserts and Modern Man, T. L. Smiley, and J. H. Zumberge, eds., University of Arizona Press, Tucson, p 115-118, 1974. 10 ref.

Descriptors: *Arctic, *Resources, *Resources allocation, *Resources development, Oil, Gas, Clays, Sands, Gravels, Gold, Transportation, Communication.
Identifiers: *Bering Sea.

The historical development of Arctic resources is described. Resources are listed as renewable, nonrenewable, and nonexpendable. Three major factors inhibiting Arctic development are (1) lack of adequate transportation systems, (2) limitations of communication systems, and (3) inadequacies of a supply of reliable labor. Renewable resources are the plants and animals from the land and sea. Nonrenewable resources are (1) non-metals like sand, gravel, clay, fluorspar, and crushed stone, (2) the metallic ores, (3) coal, and (4) oil and gas. Examples of nonexpendable resources are scenery, open tundra, midnight sun, the ice-flecked Arctic ocean, and sport fishing. (Garrettson-Arizona)
W75-10462

RESOURCE DEVELOPMENT IN CANADA'S HIGH ARCTIC,
G. Jacobsen.
In: Polar Deserts and Modern Man, T. L. Smiley and J. H. Zumberge, eds., University of Arizona Press, Tucson, p 119-121, 1974.

Descriptors: *Canada, *Arctic, *Pollutants, *Resources development, Wildlife, Oil, Natural gas, Oil spills, Fossil fuel, Domestic wastes, Recreation, Mining, Pipelines.
Identifiers: Renewable resources, Nonrenewable resources.

The development of renewable and nonrenewable resources in the high polar regions of Canada is discussed. The only renewable resource which is exported is furs. Another renewable resource is the enormous empty space which will be a great asset for recreation and leisure activities. Nonrenewable resources under exploration are oil, gas, and minerals. The Canadian High Arctic will become a major supplier of fossil fuel energy. Major factors thought to affect rapid development of resources are lack of ambition due to a highly taxed welfare society, and changes in social structure and way of living. A serious environmental hazard is pollution resulting from sewage and garbage disposal from permanent Arctic settlements. Another pollution hazard is oil spills resulting from tanker damage and oil pipeline breaks. (Garrettson-Arizona)
W75-10463

LARGE SCALE LABORATORY DIRECT SHEAR TESTS ON ICE,
Alberta Univ., Edmonton. Dept. of Civil Engineering.
W. D. Roggensack.
Canadian Geotechnical Journal, Vol 12, No 2, p 169-178, May 1975. 9 fig, 2 tab, 10 ref.

Descriptors: *Ice, *Lake ice, *Shear strength, Mechanical properties, Strength, Shear, Strength of materials, On-site tests, On-site investigations, Equipment, Testing procedures, Failure(Mechanics), Laboratory equipment, Laboratory tests, Civil engineering, Mechanical engineering.

The results of a series of large-scale direct shear tests performed on lake ice were presented. Test specimens were oriented with the principal stresses acting in the plane of the ice sheet, approximately normal to the long axes of the columnar crystals. Sample dimensions were large in comparison with mean crystal diameter, reducing the possibility of deviations introduced by size effects. Although a number of assumptions were made concerning stress conditions at failure, results for uniform, artificially 'seeded' test pond ice indicated a failure mechanism that was frictional and consistent with triaxial test data reported elsewhere. Post-peak shear resulted in the formation of a distinct failure zone that also displayed a frictional response. The direct shear test described is robust and simple, does not require elaborate sample preparation, and may present an alternative method of strength determination for ice mechanics problems where the shear box configuration duplicates field stress conditions and constraints. (Sims-ISWS)
W75-10502

SNOW CREEP: ITS ENGINEERING PROBLEMS AND SOME TECHNIQUES AND RESULTS OF ITS INVESTIGATION,
British Columbia Univ., Vancouver. Dept. of Geological Sciences.
W. H. Mathews, and J. R. Mackay.
Canadian Geotechnical Journal, Vol 12, No 2, p 187-198, May 1975. 9 fig, 9 ref.

Descriptors: *Snowpacks, Movement, *Pressure, *Canada, Snow, Mechanical properties, Mountains, Slopes, Density stratification, Surveys, Elastic deformation, On-site investigations, Equipment, Engineering.
Identifiers: *Snow creep.

Aspects of the slow creep of the snow pack on mountain slopes in southern British Columbia were investigated. Studied particularly were (1) the rate of slip of the basal layer of snow on its substratum, (2) the pressures applied by the creeping snow pack on some stationary obstacles, and (3) the regional and the year-to-year variations of such pressures. Simple, relatively inexpensive equipment and methods were developed to explore these problems. These indicate, for example, basal creep velocities up to 90 cm per winter season on very steep slopes, and pressures in the order of 0.5 kg/sq cm under extreme conditions. These studies led to guidelines for future site investigations of areas subject to snow creep. (Sims-ISWS)
W75-10503

THE INFLUENCE SURFACE METHOD FOR FLOATING ICE PLATES,
Ballistic Missile Defense Systems Command Field Office, Madison, N.J.
W. T. Palmer.
Canadian Geotechnical Journal, Vol 12, No 2, p 224-234, May 1975. 6 fig, 25 ref.

Descriptors: *Ice, *Floating, *Loads(Forces), Lake ice, Mechanical properties, Youngs modulus, Bearing strength, Theoretical analysis, Engineering, Graphical analysis, Numerical analysis.
Identifiers: *Floating ice plates, Bending moments, Influence functions.

In order to simplify the calculations of bending moments in floating ice plates subjected to slowly moving loads or static loads of short duration, influence functions for infinite plates floating on a liquid were derived and then presented graphically in the form of influence charts. The presented charts and analyses were based on the elastic theory of plates. It was shown how to use the charts in practice. Two numerical examples were presented. (Sims-ISWS)
W75-10504

TOWARD AN ICE-FREE ARCTIC OCEAN,
Washington Univ., Seattle. Dept. of Oceanography.
K. Aagaard, and L. K. Coachman.
EOS, Transactions American Geophysical Union, Vol 56, No 7, p 484-486, July 1975. 2 fig, 7 ref. ONR Contract N00014-67-A-0103-0021.

Descriptors: *Sea ice, *Arctic Ocean, *River regulation, *Diversion, Melting, Salinity, Alteration of flow, Oceans, Rivers, Temperature, Chemical properties, Weather, Oceanography.

The strong salinity stratification of the Arctic Ocean prevents substantial ice-free conditions in winter by suppressing convection and reducing upward heat flux from Atlantic Ocean water. These conditions would be significantly altered in the sensitive southern Eurasian Basin if suggested diversions of western Siberian rivers were accomplished. In the extreme case of the Yenisei and the Ob', which are both diverted southward, in the absence of possible feedback mechanisms much of the halocline over nearly 1,000,000 sq km of the Eurasian Basin would be swept out of the Arctic Ocean by the prevailing currents within 2-3 years. The likely results would be (1) prolonged ice-free conditions because of deep-reaching free convection in the ocean; (2) release of large amounts of heat from the warm Atlantic water to the atmosphere during the cold months; and (3) elevation of quite saline water into close proximity with the sea surface, both on and off the shelf, leading to deep-water formation within the Arctic Ocean. Even partial and limited restriction of the entrance of fresh water into the Kara Sea may contribute in significant ways toward realization of the first two results. (Sims-ISWS)
W75-10532

FLOATING GLACIAL ICE CAPS IN THE ARCTIC OCEAN,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
W. S. Broecker.
Science, Vol 188, No 4193, p 1116-1118, June 13, 1975. 1 fig, 15 ref. NSF Grant GA-27546.

Descriptors: *Sea ice, *Arctic Ocean, *Glaciers, Ice-water interfaces, Climatology, Paleoclimatology, Ice jams, Cold regions, Isotope studies.
Identifiers: *Ice thickness, Ice caps.

Two arguments were presented, one in favor of the existence of thicker ice in the Arctic Ocean during glacial time, and the other in favor of a full-fledged Arctic ice cap. The first was based on the Greenland air temperature record obtained from isotopic studies of the Camp Century ice core. The second was based on the oxygen isotope record of benthic foraminifera from a deep Pacific Ocean core. (Sims-ISWS)
W75-10533

GLACIER-FLOW PATTERNS AND THE ORIGIN OF LATE WISCONSINAN TILL IN THE SOUTHERN ROCKY MOUNTAIN TRENCH, BRITISH COLUMBIA,
British Columbia Univ., Vancouver. Dept. of Geological Sciences.
J. J. Clague.

Geological Society of America Bulletin, Vol 86, No 6, p 721-731, June 1975. 10 fig, 1 tab, 59 ref.

Descriptors: *Glaciers, *Geomorphology, *Till, *Canada, Glacial sediments, Glacial drift, Glacial soils, Sediments, Rocky Mountain region, Stratigraphy, Geologic history, Quaternary period, Glaciology.
Identifiers: *Rocky Mountain Trench(British Columbia), Till fabric, Till composition.

Late Wisconsinan glacier-flow patterns and till genesis in the southern Rocky Mountain Trench, British Columbia, were determined by studying glacial landforms, till fabric, and till composition. A major shift in the pattern of glacier flow occurred near the end of glaciation; tributary glaciers coalescent with the trunk glacier in the Trench receded, and side valleys were invaded by the trunk glacier. Final recession of the trunk glacier occurred with no major halts and without stagnation of the terminus. Till associated with drumlins in the Trench accumulated by lodgement of particles due to subglacial pressure melting against a planar substratum. Fabric results from the lower part of the younger till sheet suggest either complex patterns of ice flow similar to those at junctions of many modern valley glaciers, or mass movement of supraglacial till associated with an interstadial interval within the late Wisconsinan glaciation. Compositional analysis is relatively insensitive as an indicator of short-lived ice-flow fluctuations in the southern Trench. Rather, till composition reflects the dominant pattern of ice flow during glaciation: a south- to south-east flowing trunk glacier augmented by coalescent tributary glaciers. Most pebbles and fine-grained sand in the tills of the Trench are of local origin. Local constituents decrease in relative amounts away from the mouths of tributary valleys where they are derived. These decreasing gradients result largely from progressive deposition and dilution. (Sims-ISWS)
W75-10539

HYDRAULICS AND MECHANICS OF RIVER ICE JAMS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 8B.
W75-10556

ICINGS ALONG THE TRANS-ALASKA PIPELINE ROUTE,
Geological Survey, Anchorage, Alaska.
C. E. Sloan, C. Zenone, and L. R. Mayo.
Open-file report 75-87, 1975. 39 p, 32 fig, 8 ref.

Descriptors: *Ice, *Alaska, *Pipelines, *Oil, Construction, Roads, Airports, Ice loads, Melt water, Flood plains, Erosion, Data collections, Maps, Aerial photography.
Identifiers: *Trans-Alaska pipeline route, Icing effects.

The location and extent of icings observed during six winters, 1969 to 1974, along the trans-Alaska pipeline route are shown on a series of maps and photographs. Large flood-plain icings occur in the braided river channels of the Sagavanirktok, Atigun, Dietrich, and Delta Rivers. Numerous lesser stream and hillside icings also occur along the pipeline route. Construction of the pipeline, roads, pumping stations, and training structures will displace some existing icings and will create new icings. Icings may cause problems such as flooding and erosion when they form on or near the pipeline, roads, and other pipeline facilities. (Woodard-USGS)
W75-10592

A WEIBULL PREDICTION OF THE TENSILE STRENGTH-VOLUME RELATIONSHIP OF SNOW,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
R. A. Sommerfeld.
Journal of Geophysical Research, Vol 79, No 23, p 3353-3356, August 10, 1974. 3 fig, 1 tab, 15 ref.

Descriptors: Avalanches, *Tensile strength, *Snow management, Slabs, Forecasting.
Identifiers: *Weibull prediction, Slab failure.

A comparison of previous work and data presented here show that the brittle tensile strength of snow varies with sample volume. If the hypothesis that snow has a predictable minimum tensile strength and that volume larger than 1 cubic meter exhibit the minimum strength could be verified, predictions of slab failure might be greatly simplified. (Forest Service)
W75-10651

AVALANCHE WARNINGS: CONTENT AND DISSEMINATION,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
A. Judson.
Research Note RM-291, June 1975. 8 p, 2 fig.

Descriptors: *Avalanche, Snow management, Warning systems, Communications, Radio communication systems, Networks.
Identifiers: Avalanche information dissemination.

Snow avalanche warnings are an effective method of alerting the public to unusually dangerous avalanche conditions. An effective warning message conveys a sense of urgency, and should have an official and authoritative source. The message must be simple, clear, and concise. Warnings are transmitted through the National Weather Service's communications network to the media and public. Timely release of bulletins elicits good media coverage. (Forest Service)
W75-10653

AVALANCHE PROTECTION IN SWITZERLAND.
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 8C.
W75-10656

THE SNOWY TORRENTS: AVALANCHE ACCIDENTS IN THE UNITED STATES 1967-71,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
K. Williams.
General Technical Report, RM-8, March, 1975. 190 p.

Descriptors: *Avalanches, *Accidents, Snow management, Safety, United States, Safety factors.
Identifiers: *Avalanche safety, Avalanche accidents.

This compilation of 76 avalanche accident reports teaches by example, both good and bad. Commentaries will help those who spend time in the mountains in winter how to avoid getting caught in an avalanche, or if caught, how to survive. (Forest Service)
W75-10657

SNOW AVALANCHE SITES: THEIR IDENTIFICATION AND EVALUATION,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
M. Martinelli, Jr.
Agriculture Information Bulletin 360, 1974, 27 p. 28 fig, 13 ref.

Descriptors: *Avalanches, Building, Construction, Safety, *Safety factors, *Snow management, Sites.
Identifiers: *Avalanche sites.

Avalanches in mountain areas threaten lives and damage property. Persons who plan to build new facilities or expand or relocate old ones should know how to recognize potentially dangerous sites. This bulletin describes and illustrates avalanche-prone areas and recommends a checklist to help evaluate field evidence of avalanche activity. (Forest Service)
W75-10659

WATER-YIELD IMPROVEMENT FROM ALPINE AREAS: THE STATUS OF OUR KNOWLEDGE,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 3B.
W75-10660

NEW ENGINEERING CRITERIA FOR SNOW FENCE SYSTEMS,
Forest Service (USDA), Laramie, Wyo. Rocky Mountain Forest and Range Experiment Station.
R. D. Tabler.
Transportation Research Record 506, p 65-78 (1974). Transportation Research Board/National Research Council, Washington, D.C. 13 fig, 1 tab, 9 ref.

Descriptors: *Snowpacks, *Windbreaks, *Snow management, Snow removal, *Blizzards, Engineering structures, *Design criteria, Shelterbelts, Roads, Water yield improvement, Barriers, Roadbanks, Highways, *Wyoming.
Identifiers: *Snow fences, Snow control, Snow protection, Blowing snow.

New engineering criteria have been used to design a snow control system that is unusually effective in preventing drifts, improving visibility, and reducing formation of road ice. This paper describes these criteria and the research results on which they are based. A method for estimating the amount of blowing snow is used to determine the height and number of rows of fencing required at each site. Design and capacity of the new Wyoming Highway Department standard-plan fence is given. Tall (3.8m) fences have been used in preference to shorter ones because experience has shown taller structures to be more efficient in trapping snow and to have a much lower construction cost per unit of storage. Terrain can be used to greatly increase the capacity of snow fences -- capacity is increased about 15-20% for each 0.017 rad of downslope behind a fence and about 15% for each 0.017 rad of upslope in the approach zone. Because wind sweeping around fences ends reduces storage capacity significantly over a distance from the ends of 12 times the height, length of fences should be at least 30 times their height, and staggered barriers should be overlapped at least 8 times their height. (Forest Service)
W75-10692

NEW SNOW FENCE DESIGN CONTROLS DRIFTS, IMPROVES VISIBILITY, REDUCES ROAD ICE,
Forest Service (USDA), Laramie, Wyo. Rocky Mountain Forest and Range Experiment Station.
R. D. Tabler.
In: Annual Transportation Engineering Conference (Colorado University, Denver, February 1973) Proceedings 46, p 16-27. 10 fig, 3 ref.

Descriptors: *Snowpacks, *Snow management, Snow removal, *Blizzards, Engineering structures, Highways, *Windbreaks, *Highway icing, Roads, Barriers, Roadbanks, Shelterbelts, *Wyoming, Design.
Identifiers: *Snow fences, Snow control, Snow protection, Blowing snow.

An extensive snow fence system has been built to control blowing and drifting snow on Interstate Highway 80 in southeastern Wyoming, using

recent research results to determine best height, number of rows, and optimum location of the fences. This paper provides photographic documentation of the dramatic improvement in visibility and ice formation behind the new fences, and the exceptionally effective control of drifting snow. (Forest Service)
W75-10693

ESTIMATING THE TRANSPORT AND EVAPORATION OF BLOWING SNOW,
Forest Service (USDA), Laramie, Wyo. Rocky Mountain Forest and Range Experiment Station.
R. D. Tabler.
In: Symposium on Snow Management on the Great Plains (Bismarck, North Dakota, July 29, 1975), Great Plains Agricultural Council Publication 73, p 85-104. 6 fig, 2 tab, 8 ref.

Descriptors: *Sublimation, *Evaporation, *Snow management, *Snowpacks, Water yield improvement, *Blizzards, Vegetation effects, Shelterbelts, Windbreaks, Brush, Barriers, Watershed management, Snow removal, Mathematical models, Particle size, Range management, *Wyoming.
Identifiers: *Blowing snow, Snow accumulation, Snow control, Snow fences.

Complexity of the physical processes does not permit the transport and evaporation of windblown snow to be estimated from a purely theoretical analysis. This paper describes a simplified conceptual model based on the maximum distance that a particle can travel before complete evaporation, and derived from consideration of the consequences of a non-uniform particle size distribution. Model predictions agree well with snow accumulations measured at numerous sites in southeast Wyoming over several years. Results indicate a significant portion of the winter's precipitation is lost to in-transit evaporation on sites where snowfall is relocated by wind. An example is given of how this model can be used to assess effects of land management practices on the transport and evaporation of blowing snow. (Forest Service)
W75-10695

GEOTHERMAL CHANNEL AND HARBOR ICE CONTROL SYSTEM,
For primary bibliographic entry see Field 4A.
W75-10734

2D. Evaporation and Transpiration

CANOPY WEIGHT DISTRIBUTION AFFECTS WINDSPEED AND TEMPERATURE IN A LODGEPOLE PINE FOREST,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4A.
W75-10654

ESTIMATING THE TRANSPORT AND EVAPORATION OF BLOWING SNOW,
Forest Service (USDA), Laramie, Wyo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2C.
W75-10695

EFFECTIVENESS OF PRECIPITATION IN A MOUNTAIN MEADOW,
Agricultural Research Service, Fort Collins, Colo.
E. G. Kruse, and H. R. Haise.
In: Agricultural and Urban Considerations In Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 627-646, 1974. 9 fig, 3 tab.

Descriptors: *Evapotranspiration, *Grasses, *Precipitation(Atmospheric), *Irrigation, *Colorado, Rainfall, Runoff, Evaporimeters, Humidity, Solar radiation, Evaporation pans, Storms, Water table, Temperature, Mountains, Wind velocity, Water utilization.
Identifiers: *Meadow grasses, *Gunnison(Col), Meadow irrigation, Sunken tanks, ET tanks, Precipitation effectiveness.

Evapotranspiration was measured during three seasons at each of two locations in high mountain meadows in Colorado. Sunken ET tanks with native vegetation and with the water table maintained near the surface were used to obtain the measurements. Class A pan evaporation, total solar radiation, temperature, humidity, and wind speed were measured daily. Evapotranspiration varied from 59.6 to 70.5 cm (23.5 to 27.8 inches). Measured ET averaged about 82% of evaporation. During two seasons, the effectiveness of precipitation in reducing the demand for irrigation water was determined by sheltering two of the ET tanks during storms while the other tanks were left unprotected. Small storms, less than 0.50 cm (0.20 inch), averaged about 50% effective in reducing irrigation water demand. The effectiveness of all rainfall received during the growing season was 75%. (See also W75-10769) (Roberts-ISWS)
W75-10799

2E. Streamflow and Runoff

PROCEEDINGS SYMPOSIUM ON STATISTICAL HYDROLOGY.
Agricultural Research Service, Washington, D.C.
For primary bibliographic entry see Field 2A.
W75-10507

SOME PROBLEMS IN PURE AND APPLIED STOCHASTIC HYDROLOGY,
Toronto Univ. (Ontario). Dept. of Mechanical Engineering; and Toronto Univ. (Ontario). Inst. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 2A.
W75-10508

MULTISITE STREAMFLOW SIMULATION OF TRUCKEE RIVER, NEVADA,
Nevada Univ., Reno. Desert Research Inst.
V. L. Gupta, and J. W. Fordham.
In: Proceedings Symposium on Statistical Hydrology, Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publication 1275, p 26-46, June 1974. 15 fig, 4 tab, 11 ref.

Descriptors: *Simulation analysis, *Streamflow, *Model studies, *Rivers, *Nevada, Runoff, Stream gages, Statistical models, Mathematical models, Analytical techniques, Monthly, Temporal distribution, Frequency, Hydrology.

The problems associated with conducting sequential simulation studies of monthly streamflow were discussed. Focus was on a configuration of six gaging stations in the Truckee River System. The concepts of simulation were structured in such a manner that both the serial and cross correlations of the station-to-station dependence was preserved. The results were investigated by comparing the statistical properties of the simulated sequences and the historic flow inputs. Some of these properties include mean, standard deviation, and skewness; correlograms; and frequency distributions. Lack of meaningful agreement in the statistics of historic and simulated sequences for Tahoe inflow, particularly for the low flow regime, is attributable to the use of a blanket 'Log-Pearson Type III distribution' for all stations, for all seasons, and for each month. Tahoe inflow is predominantly a consequence of the precipitation on the large body of water. Lag time and the frequency distribution of precipitation and streamflow are distinctly different. Consequently, postulating the same parent distribution has led to discrepancies. Smoothing and truncating the skew coefficients as advocated by the method used is partially responsible for the lack of agreement between historic and simulated sequences. (See also W75-10507) (Sims-ISWS)
W75-10509

GENERAL ASPECTS OF MULTIVARIATE ANALYSIS WITH APPLICATIONS TO SOME PROBLEMS IN HYDROLOGY,
Agricultural Research Service, Chickasha, Okla.
For primary bibliographic entry see Field 2A.
W75-10510

STATISTICAL TOLERANCE LIMITS FOR A PEARSON TYPE III DISTRIBUTION,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
J. R. Wallace, and D. G. Fontane.
In: Proceedings Symposium on Statistical Hydrology, Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publication No 1275, p 69-77, June 1974. 5 fig, 1 tab, 10 ref.

Descriptors: *Statistics, *Flood frequency, *Flood recurrence interval, Statistical methods, Probability, Hydrology, Floods, Frequency curves, Mathematical studies.
Identifiers: *Pearson Type III distribution, *Statistical tolerance limits.

Flood frequency analysis is a statistical prediction of future events. From a sample of flood data, specified recurrence interval floods can be estimated. Because these specified recurrence interval floods are determined from a sample of all possible floods, they can be expected to vary in the future. Statistical tolerance limits provide a means of estimating the range of future variation in a specified recurrence interval flood. Methods for determining statistical tolerance limits for the Pearson Type III distribution, which forms the basis for flood frequency analyses performed by federal agencies, have not been available. Development of tolerance limits depends on the determination of tolerance factors. A theoretical approach to the development of tolerance factors for the Pearson Type III distribution was attempted but was not sucessful. A numerical technique was then tried. By simulation on a digital computer, samples from a person Type III distribution were generated. A set of emperical tolerance factors was developed directly from the generated data. These tolerance factors exhibit several expected characteristics: the factors increase with skew, probability, and population proportion, and decrease with sample size. (See also W75-10507) (Sims-ISWS)
W75-10511

A MODEL OF STATISTICAL ERRORS IN ESTIMATING STREAMFLOW FROM CONTINUOUS-STAGE RECORDS,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
R. B. Thomas.
In: Proceedings Symposium on Statistical Hydrology, Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publication No 1275, p 84-96, June 1974. 3 fig, 3 tab, 4 ref.

Descriptors: *Streamflow, *Statistics, *Stage-discharge relations, Discharge(Water), Calibrations, Hydrographs, Stream gages, Discharge measurement, Statistical methods, Model studies, Hydrology.
Identifiers: *Statistical errors, Variance.

Determining discharge from continuous-stage streamflow records is subject to several sources of error. When a power function is used as a rating model, one error source is estimating parameters for the model. The hydrograph is divided into a series of 'intervals' by selecting data points from it.

If the hydrograph is assumed to be linear during each interval, discharge could be calculated if the rating model parameters were known. The errors in flow as a result of using estimates of these parameters were discussed. Approximate estimators for bias and standard error in estimating interval and daily flow were developed. Consequences of the model and results of applying these estimators on actual streamflow records were reported. (See also W75-10507) (Sims-ISWS)
W75-10512

AN EVENT-BASED STOCHASTIC MODEL OF AREAL RAINFALL AND RUNOFF,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 2B.
W75-10521

USE OF AUTOREGRESSIVE RUNOFF MODELS IN RESERVOIR STUDIES,
Washington Univ., Seattle. Dept. of Civil Engineering.
S. J. Burges.
In: Proceedings Symposium on Statistical Hydrology, Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publication No 1275, p 287-294, June 1974. 4 fig, 14 ref.

Descriptors: *Reservoirs, *Runoff, *Model studies, *Regression analysis, Reservoir storage, Reservoir operation, Statistical models, Markov processes, Hydrology, Storage, Inflow.
Identifiers: *Autoregressive runoff models.

The problem of determining an adequate model to generate streamflow volumes for use in a reservoir size determination study was examined from a systems analysis viewpoint. A brief history of runoff models used in reservoir studies was given to illustrate how available data and technology have influenced the degree of model sophistication employed. A simple annual Markov model was used to illustrate problems associated with the mechanics of generation, particularly with respect to the adequacy of Monte Carlo sampling, to ensure procedural accuracy. The sensitivity of reservoir storage requirements to slight changes in model parameter values illustrates parameter ranges where even the simplest stochastic runoff models are critically limited by input data uncertainites. For such cases, the end product of an operation study can be extremely uncertain. There clearly is a limit to the advances that can be made in engineering hydrology by considering watershed runoff as a stochastic process. When runoff variability is large, more realistic streamflow volume models can be constructed by modeling precipitation as a stochastic process and routing stochastically generated precipitation through a deterministic watershed model thus more accurately reflecting the complex interactions that occur within the watershed. (See also W75-10507) (Sims-ISWS)
W75-10523

STATISTICAL INFERENCE ON STREAMFLOW PROCESSES WITH MARKOVIAN CHARACTERISTICS,
Arizona Univ., Tucson. Dept. of Mathematics.
J. L. Denny, C. C. Kisiel, and S. L. Yakowitz.
In: Proceedings Symposium on Statistical Hydrology, Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publication No 1275, p 309-322, June 1974. 27 ref OWRT A-023-ARIZ(2).

Descriptors: *Streamflow, *Model studies, *Markov processes, *Statistical models, Stochastic processes, Simulation analysis, Streams, Hydrographs, Statistics, Hydrology.
Identifiers: Markov chain models.

A model of certain streamflows was formulated in terms of a random process which is a function of a Markov process with stationary transition probability. This process was approximated by a higher order Markov process with stationary transition probabilities. By using streamflow data from measuring stations in Arizona, the model was applied to study questions about changes in the frequency of moderately long wet and dry periods, prediction of streamflow behavior using only past streamflow records, long range trends of streamflow, and other problems. Some questions about approximating the model by higher order Markov processes were raised but not satisfactorily answered. (See als W75-10507) (Sims-ISWS)
W75-10525

A NOTE ON MIXED DISTRIBUTIONS IN HYDROLOGY,
State Univ. of New York, Syracuse. Coll. of Environmental Science and Forestry.
R. H. Hawkins.
In: Proceedings Symposium on Statistical Hydrology, Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publication No 1275, p 336-344, June 1974. 6 fig, 1 tab, 16 ref, 1 append.

Descriptors: *Frequency curves, *Hydrology, *Mathematical models, Hydrologic data, Probability, Analytical techniques, Floods, Flood peak, Streamflow, Snowmelt, Pollutants, Distribution, Distribution patterns.
Identifiers: *Curve fitting, *Mixed distributions.

The use of mixed distributions in hydrology was explored, and a decomposition technique through the method of moments was reviewed and further developed. The distinction between mixed distributions and mixed variables in hydrology and drawn and illustrated. Several hydrologic records were decomposed and the resultant frequency distributions were compared against the customary Pearson-III. The use of a mixed distribution model in the place of the currently used distributions was not demonstrated. (See also W75-10507) (Sims-ISWS)
W75-10527

DEVELOPING REGIONAL STOCHASTIC DATA BASES,
Iowa State Univ., Ames. Dept. of Economics.
J. C. Wade, A. D. Weiss, and L. R. Beard.
In: Proceedings Symposium on Statistical Hydrology, Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publication No 1275, p 345-355, June 1974. 5 fig, 4 ref. OWRT C-1681(No 3156)(3).

Descriptors: *Hydrologic data, *Mathematical models, *Simulation analysis, *Texas, Streamflow, Date collections, Data processing, Hydrology, Model studies, Stochastic processes.
Identifiers: *Data extension, *Sabin River(Tex), Fill-in techniques.

Basic to all water resource planning, design, and operation studies is the development of an acceptable hydrologic and meteorologic data base. Because most of the available historical records either have gaps located within an otherwise continuous set of observations or long periods of missing observations prior to gage installation or subsequent to gage removal, the problem of how to reconstitute the missing observations over the appropriate temporal and spatial horizon and then generate other equally likely stochastic data sets is one of considerable importance. Several methodologies and associated computer programs exist for filling noncontinuous multistation data sets. The successes and failures realized in striving to use one of these techniques, the Monthly Streamflow Simulation Program (MOSS), in eastern Texas were discussed. Specific modifications which were made to MOSS, in order to develop acceptable filled-in data bases, were also presented; and usage procedures were suggested for developing filled-in and stochastic data bases in eastern Texas. (See also W75-10507) (Sims-ISWS)
W75-10528

RECURRENCE INTERVALS OF ANNUAL MINIMUM STREAMFLOWS,
Keystone Junior Coll., LaPlume, Pa. Dept. of Mathematics.
E. S. Joseph.
In: Proceedings Symposium on Statistical Hydrology, Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publication No 1275, p 366-370, June 1974. 1 tab, 7 ref.

Descriptors: *Low flow, *Droughts, *Model studies, *Mathematical models, *Missouri, Flow, *Streamflow, Probability, Frequency, Frequency curves, Hydrology.
Identifiers: *Return periods.

Prerequisite to comprehensive planning for development of water resources in a river basin is the knowledge of the low-flow characteristics of streams in the basin. Information essential to planned development of water resources includes the magnitude and frequency of annual droughts. Such information concerning probable extremes can be obtained by a frequency analysis, using past records of the watershed. Owing to the variation of streamflow minimums, the analysis has to be necessarily done in a probabilistic framework. An analytical approach for estimating the magnitudes of annual droughts in a stream corresponding to specified return periods was proposed. The method was illustrated by a frequency analysis performed on the data of 26 storms in Missouri. The 10-, 50-, and 100-year droughts based on likelihood estimates were presented for these stations. With the help of a computer program, this method yielded results readily and overcame the disadvantages inherent in graphical procedures. (See also W75-10507) (Sims-ISWS)
W75-10530

A TWO-DISTRIBUTION METHOD FOR FITTING MIXED DISTRIBUTIONS IN HYDROLOGY,
Illinois State Water Survey, Urbana.
K. P. Singh.
In: Proceedings Symposium on Statistical Hydrology, Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publication No. 1275, p 371-382, June 1974. 5 fig, 2 tab, 15 ref.

Descriptors: *Mathematical models, *Frequency curves, *Hydrology, *Hydrologic data, Floods, Runoff, Streamflow, Probability, Computer programs, Data processing, Analytical techniques, Distribution patterns, Distribution.
Identifiers: *Curve fitting, *Mixed distributions, Log-Pearson type III distribution.

Samples of many hydrologic variables - such as floods, runoffs, and droughts - do not conform to any one standard distribution. The distributions obtained from the samples were considered as mixed distributions, each of which can be decomposed into two or more components. An objective methodology was developed for obtaining the parameter estimates of two component distributions constituting a mixed distribution. This methodology generated first-order estimates of means and variances of the component distributions and then refined them using an iteration procedure that minimized the sum of squared differences between the observed and fitted normal deviates. A mixture of only two normal distributions was shown to simulate satisfactorily the observed annual floods and monthly streamflows. The magnitudes of mean and variance obtained from the fitted mixed distributions were in accord with the corresponding estimates obtained from the observed flood distributions. In the case of monthly streamflow, the parameters of the component distributions possessed annual cycles. (See also W75-10507) (Sims-ISWS)
W75-10531

ON THE JOINT DISTRIBUTION OF THE PERIODS AND AMPLITUDES OF SEA WAVES,
National Inst. of Oceanography, Wormley (England).
For primary bibliographic entry see Field 2L.
W75-10534

DAILY TEMPERATURE AND SALINITY OF SURFACE WATER OF PATUXENT RIVER AT SOLOMONS, MARYLAND, BASED ON 30 YEARS OF RECORDS (1938-1967),
Maryland Univ., Solomons. Chesapeake Biological Lab.
D. E. Ritchie, Jr., and J. B. Genys.
Chesapeake Science, Vol 16, No 2, p 127-133, June 1975. 2 tab, 1 ref.

Descriptors: *Salinity, *Temperature, *Water quality, *Maryland, Chemical properties, Water properties, Saline water, Sea water, Physical properties, Thermal properties, Tides, Tidal waters, Surface waters, Rivers, Density, Statistical methods, On-site data collections.
Identifiers: Daily, *Patuxent River(Md), Bristol thermograph, Standard deviation, Minimum, Maximum, Coefficient of variation.

Thirty years of daily temperature and salinity records of Patuxent River surface water at Solomons, Maryland were reported. The 30-yr average value, standard deviation, minimum, maximum, and coefficient of variation for each calendar day were calculated from the records of daily noontime observations. A fourth degree polynomial regression can be used to predict the water temperature (C) for any given day (d) of the year where February 1 is counted as day 32: C = 11 - 0.417d + 0.00624d to the 2nd power - 0.0000245d to the 3rd power + 0.0000000285d to the 4th power. The 'warm-up' period lasts 6 months from February 1 to August 1; temperature ranges from 2.4 to 27.5C with standard deviations of 0.9 to 2.1C. The 'cool-down' period is completed 6 months later. The lowest reading (-0.8C) occurred on February 10 and 11 while the highest (30C) occurred on July 31, August 1 and 3. There was no correlation between salinity and temperature. The highest mean salinity (16.0 to 16.8 ppt) occurred during October 17 to December 16, with November 19 and 20 having the highest value. The lowest mean salinity (10.2-10.9 ppt) occurred during April 15 to June 10, with lowest value of 10.2 ppt on April 27, 30, and May 1. There were 187 days between dates of mean highest and mean lowest salinity. The lowest individual salinity recorded was 5.4 ppt on June 7, and the highest was 20.9 ppt on December 12. Coincidently, 188 days separate these day-of-the-year occurrences. (Henley-ISWS)
W75-10535

NONLINEAR CHANNEL ROUTING BY COMPUTER,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W75-10543

SOME FEATURES OF TSUNAMIS ON THE PACIFIC COAST OF SOUTH AND NORTH AMERICA,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
For primary bibliographic entry see Field 2L.
W75-10554

FLOOD HAZARDS IN THE SEATTLE-TACOMA URBAN COMPLEX AND ADJACENT AREAS, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 7C.
W75-10580

A COMPARISON OF METHODS FOR ESTIMATING FLOOD PEAKS ON STREAMS IN MASSACHUSETTS,
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 4A.
W75-10587

INDEX TO WATER RESOURCES DATA FOR LOUISIANA: SURFACE WATER RECORDS; WATER-QUALITY RECORDS.
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 5A.
W75-10590

HYDROLOGIC DATA FOR URBAN STUDIES IN THE FORT WORTH, TEXAS METROPOLITAN AREA, 1973,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W75-10596

LOW-FLOW CHARACTERISTICS OF MISSISSIPPI STREAMS,
Geological Survey, Jackson, Miss.
E. J. Tharpe.
Mississippi Board of Water Commissioners, Jackson, Bulletin 75-1, 1975. 60 p, 5 fig, 2 tab, 28 ref.

Descriptors: *Low flow, *Streamflow, *Low flow frequency, *Hydrologic data, *Mississippi, Streamflow forecasting, Correlation analysis, Water yield, Discharge(Water), Gaging stations, Data collections, Runoff, Watershed management, Regulated flow.
Identifiers: 7-day average flows, 10-year recurrence interval.

Low-flow data for 443 sites on streams in Mississippi provide the basis for calculation of minimum 7-day average flows, and annual 7-day average low flows with 2-and 10-year recurrence intervals. These flow characteristics, particularly the annual 7-day average low flows with a 10-year recurrence interval, are used along with minimum observed discharges in determining the availability of flow for water supply and waste assimilation and in administering water laws and regulations. Low-flow characteristics of long-term stations were computed by a Log-Pearson Type III probability analysis of available data. For partial-record and short-term continuous-record sites these characteristics were defined from a correlation based upon flows concurrently observed at the site and at a nearby long-term station. At ungaged sites, low-flow characteristics may be approximated either by interpolation between gaged sites or from a map showing areas of near-uniform low-flow yields. These areas which are delineated on the basis of geologic and hydrologic similarities, have yields ranging from 0 to more than 0.5 cubic foot per second per square mile. (Woodard-USGS)
W75-10605

SPILLWAY FOR BURNSVILLE DAM, LITTLE KANAWHA RIVER, WEST VIRGINIA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W75-10665

THE EFFECTS OF URBANIZATION ON FLOODS OF DIFFERENT RECURRENCE INTERVAL,
University Coll., London (England). Dept. of Geography.
For primary bibliographic entry see Field 4C.
W75-10709

DETERMINE URBAN RUNOFF THE SIMPLE WAY,
Montreal Urban Community (Quebec). Water Purification Dept.
C. Mitci.
Water and Wastes Engineering, Vol 11, No 1, p 24, 26, 35-36, Jan, 1974, 15 fig, 2 tab, 16 ref, append.

Descriptors: *Rainfall-runoff relationships, *Rational formula, *Runoff forecasting, *Urban drainage, Antecedent precipitation, Urban runoff, Design storm, Duration curves, Flow system, Hydrographs, Rainfall intensity, Time series analysis, Infiltration, Time of concentration.
Identifiers: Montreal Urban Community(Canada).

The Montreal Urban Community, including 29 municipalities, wanted runoff hydrographs based on storm patterns for its runoff system designs. The widely used rational formula which assumes constant rainfall intensity and runoff throughout a storm does not give actual storm runoff patterns, needed in designing facilities, even with complex additional computer programs. A simplified method, based on precipitation statistics and updated intensity-duration curves, permits mathematical simulation of design storms of various frequencies. Both antecedent rainfall (before runoff begins) and the percentage of impervious surfaces are considered to calculate the time during the storm when rainfall exceeds infiltration and runoff begins. An excess rainfall curve is computed. A single coefficient which varies with time is used to reflect all losses such as depression storage and surface detention. From the excess rainfall curve a runoff hydrograph is computed. Data from a flow measurement program and the inflow from each sub-basin are used to route the design storm flow through sewage collectors to obtain the total system outflow hydrograph. For each given storm frequency and various percentages of impervious surface, the hydrograph peaks, concentrated through the sewer system, give a chart to determine sewer facility size. (Herr-North Carolina)
W75-10716

A CRITERION FOR VEGETATION STIFFNESS,
Waterloo Univ. (Ontario). Dept. of. Civil (Engineering.
For primary bibliographic entry see Field 4A.
W75-10782

WATERSHED BEHAVIOR AFTER FOREST FIRE IN WASHINGTON,
Forest Service (USDA), Wenatchee, Wash. Forest Hydrology Lab.
For primary bibliographic entry see Field 4C.
W75-10790

EFFECTS OF SURFACE DRAINAGE ON STREAM FLOW,
Conservation Service, Temple, Tex.
For primary bibliographic entry see Field 4A.
W75-10794

TOTAL SEDIMENT LOAD BY THE EXTRAPOLATED DATA PROCEDURE,
Agricultural Research Service, Chickasha, Okla.
For primary bibliographic entry see Field 2J.
W75-10847

SEDIMENT-YIELD CHARACTERISTICS FROM UNIT SOURCE WATERSHEDS,
Agricultural Research Service, Chickasha, Okla.
For primary bibliographic entry see Field 2J.
W75-10848

2F. Groundwater

HYDRAULIC BEHAVIOUR OF THE CHALK AQUIFER IN THE YORKSHIRE WOLDS,
Institute of Geological Sciences, London (England). Dept. of Hydrogeology.
For primary bibliographic entry see Field 4B.
W75-10506

EVALUATION OF GROUND WATER RESOURCES: SACRAMENTO COUNTY,
California State Dept. of Water Resources, Sacramento.
R. S. Ford, and L. Chee.
Bulletin No. 118-3, July 1974. 141 p, 34 fig, 22 tab, 63 ref, 1 append, 1 plate.

Descriptors: *Groundwater resources, *Hydrogeology, *Water supply, *California, *Water quality, *Hydrologic budget, Groundwater mining, Water levels, Land use, Groundwater basins, Aquifers, Subsurface waters, Water resources development, Groundwater movement, Natural recharge, Computer models, Mathematical models, Streamflow, Storage, Precipitation(Atmospheric), Pumping.
Identifiers: *Sacramento County.

Sacramento County is located in the lower portion of the Sacramento Valley and immediately north of the San Joaquin Valley. Since 1940, water demand has exceeded supply and groundwater levels have declined. Concern over the continuing trend prompted local and state agencies to begin investigation of the water resources of the area as the first step in development of alternative plans for water resource management. Results were reported of a cooperative study by the Department of Water Resources and the County of Sacramento of geologic and hydrologic conditions affecting the occurrence and movement of groundwater and the relation between recharge to and withdrawals from the groundwater systems. A description was given of a mathematical model developed during the study to simulate the reactions of the groundwater system to actions of man. The study is continuing and will evaluate alternate plans of water resource management. (Sanderson-ISWS)
W75-10546

GROUND-WATER LEVELS IN NEW MEXICO, 1972,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 4B.
W75-10582

HYDROGEOLOGY OF THE TRIASSIC ROCKS OF MARYLAND,
Geological Survey, Parkville, Md.
L. J. Nutter.
Maryland Geological Survey, Baltimore, Report of Investigations No 26, 1975. 37 p, 11 fig, 1 plate, 10 tab, 22 ref, append.

Descriptors: *Hydrogeology, *Groundwater resources, *Aquifer characteristics, *Geologic investigations, *Maryland, Water wells, Well data, Lithologic logs, Water utilization, Water yield, Water quality, Chemical analysis, Hydrologic data, Rocks, Mesozoic era.
Identifiers: *Triassic rocks(Md).

The rocks of the Newark Group of Late Triassic age in Maryland occur in the northern and western parts of the Frederick Valley in Frederick and Carroll Counties and in the western part of Montgomery County. These consolidated bedrock aquifers consist of a complex interbedded sequence of arkosic sandstone, shale, siltstone, and quartz-pebble and limestone-pebble conglomerate. Water is stored and transmitted through joints, faults, and bedding-plane partings in the rock and, to a limited extent, in interstitial pore space in the weathered rock mantle; the primary pore space in the rock has been almost eliminated by compaction and cementation. The Triassic-rock aquifers are a reliable source of water for domestic, farm, and small commercial use; only 6.5 percent of the wells inventoried yield less than 3 gallons per minute. Groundwater supplies sufficient for most commercial and light industrial use can be developed under favorable hydrogeologic conditions. Wells at least 300 or 400 feet deep return maximum water yields. The water in the Triassic-rock aquifers is generally of good chemical quality. (Woodard-USGS)
W75-10584

HYDROGEOLOGIC DATA FOR THE FARMINGTON RIVER BASIN, CONNECTICUT,
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 7C.
W75-10591

HYDROLOGICAL DATA FROM WELLS IN SOUTHWEST HILLSBOROUGH COUNTY, FLORIDA, 1950-74,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W75-10593

MAP OF THE ANTELOPE VALLEY-EAST KERN WATER AGENCY AREA, CALIFORNIA, SHOWING GROUND-WATER SUBUNITS AND AREAS, LOCATION OF WELLS, AND WATER-LEVEL CONTOURS FOR SPRING 1974,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W75-10595

SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--RIO GRANDE REGION,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4B.
W75-10597

SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--OHIO REGION,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4B.
W75-10598

A PREDICTIVE COMPUTER MODEL OF THE LOWER CRETACEOUS AQUIFER, FRANKLIN AREA, SOUTHEASTERN VIRGINIA,
Geological Survey, Richmond, Va.
O. J. Cosner.
Available from NTIS, Springfield, Va 22161 as PB-243 410, $4.25 printed copy, $2.25 in microfiche. Water-Resources Investigations 51-74, April 1975. 62 p, 33 fig, 3 tab, 9 ref, 2 append.

Descriptors: *Aquifer characteristics, *Hydrogeology, *Computer models, *Water level fluctuations, *Virginia, Atlantic Coastal Plain, Hydrologic data, Groundwater movement, Digital computers, Systems analysis, Hydrology, Pumping, Water wells, Water yield, Groundwater recharge, Transmissivity, Groundwater resources, Storage coefficient, Forecasting, Model studies.
Identifiers: *Franklin area(Va), Lower Cretaceous aquifer.

The Lower Cretaceous aquifer in southeastern Virginia was simulated by a finite-difference digital model. The area modeled is centered at Franklin, Va. The aquifer is about 600 ft thick there, and is estimated to be 2,000 ft thick 35 miles to the east. The aquifer consists of alternating permeable and semipermeable sand, gravel, silt and claybeds, and it is overlain by a semipermeable confining bed. Transmissivity is about 19,000 cu ft/day/ft at Franklin, decreasing to the west and increasing to the east. A prepumping water-level surface was developed by modeling. The use of a modeling factor, transmissivity over vertical permeability of the confining bed, is described. Simulation runs to 1941, 1970, 1972 are in good agreement with historical data. Predictive runs show that if pumpage continues to increase, dewatering will occur at Franklin. If pumpage does not increase, additional drawdown will be small. (Woodard-USGS)
W75-10599

GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1975,
Geological Survey, Salt Lake City, Utah.
J. H. Eychaner.
Utah Division of Water Resources, Salt Lake City, Cooperative Investigations Report No 14, 1975. 26 p, 37 fig, 2 tab, 13 ref.

Descriptors: *Groundwater resources, *Water levels, *Basic data collections, *Utah, Hydrologic data, Hydrographs, Maps, Water wells, Withdrawal, Water utilization, Irrigation, Surface-groundwater relationships, Water quality, Dissolved solids, Precipitation(Atmospheric), Water level fluctuations.
Identifiers: *Groundwater development.

This report is the twelfth in a series of annual reports that describe groundwater conditions in Utah. The report includes individual discussions of the most important areas of groundwater withdrawal in the State for the calendar year 1974. Water-level fluctuations, however, are described for the period spring 1974 to spring 1975. The estimated total withdrawal from wells in 1974 was about 879,000 acre-ft which was about 165,000 acre-ft more than in 1973 and 195,000 acre-ft greater than the average annual withdrawal for the period 1964-73. Both the increase over 1973 and the increase over the 10-year average were due primarily to changes in withdrawals for irrigation. Estimated total withdrawals for irrigation in 1974 were about 611,000 acre-ft, which was about 27% more than the 480,000 acre-ft withdrawn in 1973. Changes in groundwater levels from spring 1974 to spring 1975 reflected the decreased availability of surface water and the increase in groundwater withdrawals. Water levels fell in most major groundwater basins in the State. Pavant Valley, in central Utah, was the only major groundwater basin in which water levels were higher in March 1975 than in March 1974. (Woodard-USGS)
W75-10606

DRAINAGE ANALYSIS OF A CONFINING FORMATION,
Agricultural Research Service, Mandan, N. Dak. Northern Great Plains Research Center.
For primary bibliographic entry see Field 4A.
W75-10780

2G. Water In Soils

OPERATIONAL VALUE OF WEATHER INFORMATION IN RELATION TO SOIL MANAGEMENT CHARACTERISTICS,
Purdue Univ., Lafayette, Ind. Agricultural Experiment Station.
R. E. Ewalt, D. Wiersma, and W. L. Miller.
Agron J, Vol 65, No 3, p 437-439, 1973. Illus.
Identifiers: Forecasting, Management, Moisture content, *Operations, Precipitation(Atmospheric), *Soil management, *Weather information, Soil moisture.

Possible relationships between farm operator valuations of forecasts, soil management characteristics, and the accuracy of precipitation forecasts were studied. Two-thirds of the 145 interviewed farm operators used both precipitation and field conditions forecasts in planning and conducting major field operations. These operators

valued both types of forecasts at higher levels of usefulness than did the remaining 1/3, who used only precipitation forecasts. The usefulness of precipitation forecasts and field conditions forecasts increased with increasing water-holding capacity and susceptibility of soils to physical problems such as cloddiness, tillage plans and surface sealing. Farm operators who used both types of forecasts valued them at approximately the same levels of usefullness in relation to major field operations conducted during the crop season. Highest values were associated with field operations that are conducted during the spring months. Precipitation forecasts were more useful than field conditions forecasts in making general management decisions. No relationship was found between the error rates of precipitation forecasts and farm operator evaluation of their usefulness.--Copyright 1973, Biological Abstracts, Inc.
W75-10367

ADSORPTION AND DEGRADATION OF CHLORBROMURON IN SOIL,
Agricultural Research Service, Stoneville, Miss. South Weed Science Lab.
For primary bibliographic entry see Field 5B.
W75-10414

PHOSPHORUS AVAILABILITY OF SOME PHILIPPINE RICE SOILS AS AFFECTED BY SOIL AND WATER MANAGEMENT PRACTICES,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 3F.
W75-10421

SOILS OF THE HIGH ARCTIC LANDSCAPES,
Rutgers - the State Univ., New Brunswick, N.J.
For primary bibliographic entry see Field 2C.
W75-10458

APPLICATION OF LOW-LATITUDE MICROBIAL ECOLOGY TO HIGH-LATITUDE DESERTS,
Jet Propulsion Lab., Pasadena, Calif.
For primary bibliographic entry see Field 2C.
W75-10459

THE DETERMINATION OF MERCURY IN SOILS AND RELATED MATERIALS BY COLD-VAPOUR ATOMIC ABSORPTION SPECTROMETRY,
Macaulay Inst. for Soil Research, Aberdeen (Scotland).
For primary bibliographic entry see Field 5A.
W75-10485

WATER-SOIL-PLANT INTERACTIONS WITH TERBACIL,
Hawaii Univ.-Hilo Coll., Hilo.
For primary bibliographic entry see Field 5C.
W75-10486

PREDICTION OF TRIFLURALIN DIFFUSION COEFFICIENTS,
Agricultural Research Service, Stoneville, Miss. South Weed Science Lab.
For primary bibliographic entry see Field 5B.
W75-10542

PEDOLOGIC COVER OF THE WATERSHED OF THE PORECKA RIVER,
Institute for Soil Research, Belgrade (Yugoslavia).
For primary bibliographic entry see Field 2A.
W75-10551

A THEORY OF THE MASS TRANSPORT OF PREVIOUSLY DISTRIBUTED CHEMICALS IN A WATER-SATURATED SORBING POROUS MEDIUM: 4. DISTRIBUTIONS,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 5B.
W75-10632

DRAINAGE ANALYSIS OF A CONFINING FORMATION,
Agricultural Research Service, Mandan, N. Dak. Northern Great Plains Research Center.
For primary bibliographic entry see Field 4A.
W75-10780

2H. Lakes

ENVIRONMENTAL LIMITATIONS ON THE MICROBIAL DEGRADATION OF HYDROCARBONS IN TEMPERATE LAKES,
Wisconsin Univ., Madison. Dept. of Bacteriology.
For primary bibliographic entry see Field 5C.
W75-10407

SUPPRESSION OF NITROGEN FIXATION BY BLUE-GREEN ALAGE IN A EUTROPHIC LAKE WITH TRACE ADDITIONS OF COPPER,
California Univ., Berkeley. Sanitary Engineering Research Lab.
For primary bibliographic entry see Field 5C.
W75-10480

PHYSICAL MODEL STUDY OF CIRCULATION PATTERNS IN LAKE ONTARIO,
State Univ. of New York, Buffalo. Dept. of Civil Engineering.
C. Li, K. M. Kiser, and R. R. Rumer.
Limnology and Oceanography, Vol 20, No 3, p 323-337, May 1975. 11 fig, 1 tab, 31 ref. NOAA Grant 2-35281.

Descriptors: *Model studies, *Lake Ontario, *Circulation, *Hydraulic models, Boundaries(Surfaces), Gravity, Shear, Seiches, Winds, Drifting(Aquatic), Thermal stratification, Flow, Froude number, Currents(Water), Stratification, Stress, Laboratory tests.
Identifiers: Earth rotation, Hydraulic through-flow, Seiche decay, Rossby number.

A distorted hydraulic model of Lake Ontario was constructed and operated in a rotating laboratory. The model study included the effects of the earth's rotation, gravity, and hydraulic through-flow. Boundary shear in the model was checked against theoretical predictions of seiche decay. Wind shear was adjusted to achieve appropriately scaled drift velocities in the model. Observed surface and subsurface circulation patterns were presented for a homogeneous and stratified lake model with and without a westerly wind. (Roberts-ISWS)
W75-10537

INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES.
National Oceanic and Atmospheric Administration, Rockville, Md.
International Field Year for the Great Lakes (IFYGL) Bulletin No. 12, October 1974. 66 p.

Descriptors: *Great Lakes, *International Hydrological Decade, *International waters, *Canada, *United States, Lake Ontario, Publications, Programs, Data processing, Climatology, Evaporation, Model studies, Limnology, Remote sensing, Precipitation(Atmospheric), Meteorology.
Identifiers: *International Field Year for the Great Lakes.

Abstracts of nine Canadian International Field Year for the Great Lakes (IFYGL) papers related to Lake Ontario studies were given. Data for deviations from the normal (1941-1970) of record-breaking weather events were tabulated for a number of meteorological variables on a basin-wide basis. Mean monthly surface temperatures of Lake Ontario were tabulated for the normal (1966-1971) and during IFYGL. The status of data management activities in the U.S. studies was discussed and a summary of data for the final IFYGL archive was tabulated. Brief reports on both Canadian and U.S. scientific projects were included. Canadian and U.S. publications were listed. (Humphreys-ISWS)
W75-10547

INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES.
National Oceanic and Atmospheric Administration, Rockville, Md.
International Field Year for the Great Lakes (IFYGL) Bulletin No. 13, February 1975. 84 p, 2 fig, 10 tab.

Descriptors: *Great Lakes, *International waters, *International Hydrological Decade, *Canada, *United States, Lake Ontario, Programs, Publications, Water temperature, Currents(Water), Meteorology, Data processing, Remote sensing, Bibliographies.
Identifiers: *International Field Year for the Great Lakes.

Tabulated data were presented for material contribution by major tributaries on the U.S. side of Lake Ontario. Lake Ontario temperature and current data for July and August 1972 were also tabulated. Brief reports on both Canadian and U.S. scientific projects were included. Canadian and U.S. summaries of data available from final International Field Year for the Great Lakes archives were tabulated. Canadian and U.S. publications were listed. (Humphreys-ISWS)
W75-10548

INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES.
National Oceanic and Atmospheric Administration, Rockville, Md.
International Field Year for the Great Lakes (IFYGL) Bulletin No. 14, June 1975. 91 p, 7 fig, 4 tab.

Descriptors: *Great Lakes, *International waters, *International Hydrological Decade, *Canada, *United States, *Lake Ontario, Programs, Publications, Bibliographies, Eutrophication, Model studies, Data processing, Water quality, Cloud cover, Snow cover, Solar radiation, Infrared radiation, Water temperature, Wind velocity.
Identifiers: *International Field Year for the Great Lakes.

Listed were the official International Field Year for the Great Lakes (IFYGL) publications, joint Canadian-U.S. publications included in IFYGL Bulletin No. 13, and additional IFYGL publications. U.S. information was presented on cloud cover, solar and infrared radiation, radiative heating rates over central Lake Ontario, water quality characteristics of Oswego River, daily mean surface wind speed over Lake Ontario in 1971, daily mean air and lake surface temperature in 1972, comparison of airborne radiation thermometer with buoy temperature measurements, and data management. Selected abstracts were presented for a cross-section of IFYGL Canadian investigations. Brief reports on both Canadian and U.S. scientific projects were included. Canadian and U.S. summaries of data available from final IFYGL archives were tabulated. (Humphreys-ISWS)
W75-10549

INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES.
National Oceanic and Atmospheric Administration, Rockville, Md.

Available from the National Technical Information Service, Springfield, Va 22161 as COM-74-10965, $4.75 in paper copy, $2.25 in microfiche. International Field Year for the Great Lakes (IFYGL) Bulletin No. 9, February 1974. 82 p, 6 fig, 6 tab.

Descriptors: *Great Lakes, *International Hydrological Decade, *International waters, *Canada, *United States, Evaporation, Meteorology, Programs, Publications, Atmospheric physics, Lake Ontario, Fish populations, Climatology, Precipitation(Atmospheric), Data processing.
Identifiers: *International Field Year for the Great Lakes.

Information was given on the Canadian cooperative studies of fish stocks and evaporation synthesis. Brief reports on both Canadian and U.S. scientific projects were included. Canadian and U.S. publications were listed. (Humphreys-ISWS)
W75-10550

AN INVESTIGATION OF THE ECOLOGY AND WATER QUALITY OF A LAKE OUTLET,
Montana Univ., Missoula. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W75-10724

EFFECTS OF FARMING - URBAN DRAINAGE ON FRESH WATER,
Orange County Pollution Control Dept., Orlando, Fla.
For primary bibliographic entry see Field 5G.
W75-10802

2I. Water In Plants

LISTERIA IN AQUATIC ANIMALS,
California State Univ., Humboldt, Arcata. School of Natural Resources.
R. G. Botzler, T. F. Wetzler, and A. B. Cowan.
J Wildl Dis, Vol 9, No 2, p 163-170, 1973. Illus.
Identifiers: Aquatic animals, Chrysemys-picta-marginata, Deer, Helisoma-sp, Listeria, *Listeria-monocytogenes, Oxyloma-retusa, Physa-sayii, Placobdella-hollensis, Rana-catesbeiana, Rana-pipiens-pipiens, *Frogs, *Turtles, *Snails, Leopard frogs, Bullfrogs, Isolation.

Listeria monocytogenes was isolated from 7 leopard frogs (Rana pipiens pipiens), 3 bullfrogs (Rana catesbeiana), a painted turtle (Chrysemys picta marginata), a leech (Placobdella hollensis) commonly found on turtles and 3 species of snails (Physa sayii, Helisoma sp., Oxyloma retusa). Most Listeria isolations were made from leopard frogs collected from pond sites used frequently by deer, shortly after a period of heavy rain.--Copyright 1973, Biological Abstracts, Inc.
W75-10375

CHARACTERIZATION OF CADMIUM UPTAKE BY PLANT TISSUE,
California Univ., Davis. Dept. of Agronomy and Range Science.
For primary bibliographic entry see Field 5B.
W75-10479

AN ANALYSIS OF THE MECHANICS OF GUARD CELL MOTION,
Texas A and M Univ., College Station. Bioengineering Program.
D. W. Demichele, and J. H. Peter Sharpe.
Journal of Theoretical Biology, Vol 41, No 1, p 77-96, 1973. Illus.

Descriptors: *Stomata, *Cytological studies, Epidermis, *Plant morphology.
Identifiers: *Guard cell motion, Turgor pressure.

A mechanical analysis is presented of the cellular defomations which occur during the opening and closing of stomata. The aperture of the stomatal pore is shown to be a result of opposing pressures of the guard and adjacent epidermal cells. The analysis indicates that the epidermal cells have a mechanical advantage over the guard cells. With no mechanical advantage, an equal reduction in the turgor pressure of both guard and epidermal cells would have a neglible effect upon stomatal aperture. However, due to the mechanical advantage of the surrounding cells, the stomatal aperture increases with equal reductions in turgor, until the adjacent epidermal cells become flaccid. The minimum diffusion resistance of the pore occurs at this point. Further reductions in guard cell turgor lead to closure of the pore. The analysis further demonstrates how the shape, size, wall thickness and material properties of the guard cell walls influence their behavior.--Copyright 1974, Biological Abstracts, Inc.
W75-10488

GROWTH FACTORS IN THE FISH MEAL COMPONENTS OF CATFISH DIETS,
Georgia Univ., Savannah. Agricultural Experiment Station.
J. W. Andrews, and J. W. Page.
Journal of Nutrition, Vol 104, No 8, p 1091-1096, 1974.

Descriptors: Catfishes, Amino acids, *Fish diets, *Growth rates, *Channel catfish, Protein, Lipids.
Identifiers: Menhaden meal, Soybean meal.

Four feeding studies were conducted to determine to what extent soybean meal could be used to replace fish meal in diets for channel catfish (Ictalurus punctatus). When soybean meal was substituted on an isonitrogenous basis for menhaden meal, growth and feed efficiency were substantially reduced ($P < 0.05$). Gains were not enhanced when synthetic methionine, cystine or lysine, the most limiting amino acids as the results of this substitution, were added to the soy-substituted diets. When diets void of fish meal were supplemented with a lipid extract, nonlipid residue or ashed fraction of menhaden meal, growth and food conversion data revealed that the growth factors not provided by soybean meal were in the nonlipid residue of menhaden meal and were destroyed by ashing. A further study demonstrated that these factors were not polar lipids that could be removed by extraction with chloroform-methanol (2:1). These data suggested that the growth factors were in the protein fraction of menhaden meal but do not explain why growth responses were not obtained when the soy-substituted diets were supplemented with the most limiting amino acids.--Copyright 1974, Biological Abstracts, Inc.
W75-10658

IMPORTANCE OF PLANTS IN OXYGEN PRODUCTION, CARBON DIOXIDE CONSUMPTION AND AIR PURIFICATION,
Ohio Agric. Res. Dev. Cent., Wooster,Lab. Environment. Studies.
T. C. Weidensaul.
Hortscience, Vol 9, No 1, p 8-12, 1974. Illus.

Descriptors: *Oxygen, *Carbon dioxide, *Plant physiology, Production, Air environment.
Identifiers: *Air purification.

The importance of plants as suppliers of oxygen and their value as air purifiers have been questioned. This paper will present some of the facts regarding the relative importance of green plants in the production of O2 and consumption of CO2 and will put the role of plants in proper perspective as air purifiers.--Copyright 1974, Biological Abstracts, Inc.
W75-10715

EFFECTS OF SOIL MOISTURE ON STRESS ON 2 VARIETIES OF UPLAND COTTON IN ISRAEL: IV. EFFECTS OF PERIODS OF STRESS OCCURRENCE, CORRELATIONS AND REGRESSIONS,
Hebrew Univ., Rehovoth (Israel). Faculty of Agriculture.
For primary bibliographic entry see Field 3F.
W75-10791

2J. Erosion and Sedimentation

RESEARCH IN STOCHASTIC MODELS FOR BEDLOAD TRANSPORT,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
C. S. Hung, and H. W. Shen.
In: Proceedings Symposium on Statistical Hydrology, Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publication No 1275, p 262-286, June 1974. 9 fig, 24 ref. NSF Grant GK 11499.

Descriptors: *Bed load, *Sediment transport, *Model studies, *Stochastic processes, Movement, Flow, Sediment load, Running waters, Tractive forces, Streamflow, Probability, Mathematical models, Geology, Hydrology.
Identifiers: Single particle movement.

Research in stochastic models for bed load transport was reviewed, summarized, and critically examined. Discussions were given for (1) theoretical models in deriving the distributions of the step lengths and the rest periods, (2) theoretical derivation of the probability density function of the distance at a given time, (3) calculation of bed-load transport from stochastic models, and (4) experimental evidence (including recent single particle experimental results by the authors). The order of generality of all existing theoretical models was evaluated and the relationships among these were given. (See also W75-10507)
W75-10522

A STOCHASTIC MODEL OF SEDIMENT YIELD FOR EPHEMERAL STREAMS,
Agricultural Research Service, Fort Collins, Colo.
D. A. Woolhiser, and P. Todorovic.
In: Proceedings Symposium on Statistical Hydrology, Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publication No 1275, p 295-308, June 1974. 5 fig, 2 tab, 15 ref, 2 append.

Descriptors: *Sediment yield, *Ephemeral streams, *Model studies, *Stochastic processes, Sedimentation, Sediment transport, Sedimentation rates, Streamflow, Precipitation(Atmospheric), Runoff, Rainfall, Discharge(Water), Bed load, Suspended load, Hydrology.

The accumulated sediment yield of an ephemeral stream in some time interval may be treated as the sum of a random number of random variables. The number of sediment yield events in this interval is equal to the number of runoff events and is related to the number of precipitation events. Three progressively more complicated rainfall-runoff models were postulated: (1) the pure threshold model, (2) the general threshold model, and (3) the infiltration model. Analytic results for the runoff counting process were obtained for the pure threshold model and an approximation to the infiltration model was proposed. The resulting runoff counting process gave a good fit to data from two small watersheds near Hastings, Nebraska. An example was given of the application of the stochastic model of sediment yield to the problem of estimating mean and variance of annual sediment yield if only short concurrent records of sediment yield and runoff are available, but longer records of precipitation and runoff can be utilized. (See also W75-10507) (Sims-ISWS)
W75-10524

DISPERSION OF CONTAMINATED BEDLOAD PARTICLES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W75-10526

COMPETENCE OF RIVERS TO TRANSPORT COARSE BEDLOAD MATERIAL,
Texas Univ. at Austin. Dept. of Geological Sciences.
V. R. Baker, and D. F. Ritter.
Geological Society of America Bulletin, Vol 86, No 7, p 975-978, July 1975. 1 fig, 27 ref.

Descriptors: *Sediment transport, *Geomorphology, *Fluvial sediments, *Rivers, Erosion, Alluvium, Shear stress, Bed load, Coarse sediments, Particle size, Sediment load, Sedimentation, Hydraulics, Entrainment, Flow, Depth.
Identifiers: *Flow slope, Lift forces.

Shear-stress analyses provide easily determined estimates of the competence of rivers to transport coarse bed load material. Relevant data from diverse geological and engineering reports were integrated, and a good correlation between competent particle size and shear stress resulted when data points were derived in a uniform way. Because flow mechanics differ in contrasting fluvial environments, the shear stresses needed to entrain large sediment may diverge considerably from values based on theoretical grounds. In shallow rivers, entrainment may occur at lower shear stresses than predicted by the Shields theory because hydrodynamic lift and bank caving provide additional transporting force. In very deep flows, the shear stresses needed to initiate particle movement were greater than theoretical values. Potential use of the empirical relationship between particle size and shear stress was limited by the following considerations: (1) random nature of turbulent lift forces; (2) problems in interpreting the significance of the sedimentary deposit; (3) sediment finer than 5 cm in diameter was not considered; and (4) the analysis ignored special considerations of sediment packing, shape, and grain-size distributions. (Lee-ISWS)
W75-10540

SEDIMENT CHARACTERISTICS OF STREAMS IN THE EASTERN PIEDMONT AND WESTERN COASTAL PLAIN REGIONS OF NORTH CAROLINA,
Geological Survey, Raleigh, N.C.
C. E. Simmons.
Open-file report 75-291, 1975. 33 p, 9 fig, 5 tab, 13 ref.

Descriptors: *Sediment transport, *Sediment yield, *Sediment distribution, *North Carolina, Streamflow, Coastal plains, Slopes, Topography, Land use, Runoff, Storms, Reservoirs, Sediment discharge, Sedimentation rates, Data collections, Sampling, Suspended solids, Particle size.
Identifiers: *Piedmont region(NC).

The sediment-transport characteristics of streams were determined in a 6,000-square-mile area of the Coastal Plain and Piedmont regions of eastern North Carolina during 1969-73. The study covered all or parts of 21 counties and included data for 28 sediment-sampling stations located in parts of 4 major river basins, the Roanoke, Pamlico, Neuse, and Cape Fear. Annual suspended-sediment yields ranged from 333 to 12 tons per square mile. Streams in the Piedmont region have the highest yields. Suspended-sediment yield decreases in an eastward direction from the Piedmont to the Coastal Plain region. Sediment characteristics are directly affected by topography, storm runoff, geology, land use, and manmade detention structures. At one sampling station in the 1973 water year, 44 percent of the suspended sediment tonnage was transported during 34 days of high flow. In the Piedmont region, sediment yields vary indirectly with the percentage of forest cover in the basin, but there appears to be no definite relationship between forest cover and yield in the Coastal Plain region. Large lakes act as sediment-detention reservoirs. Average annual sediment yields ranges from 98 to 333 tons per square mile for 3 headwater streams which flow into Hydo Lake in Person County; however, the yield for the station less than 2 miles downstream from Hyco Dam was about 12 tons per square mile. Most suspended sediment during floods in Piedmont streams ranges in size from sand to silt, whereas the suspended material in flooding streams in the Coastal Plain is generally clay size. (Woodard-USGS)
W75-10586

CHANNEL EROSION SURVEYS ALONG SOUTHERN SEGMENT OF THE TAPS ROUTE, ALASKA, 1972 AND 1973,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 8B.
W75-10594

FLOOD WAVES AND SUSPENDED SEDIMENT PULSES IN URBANIZED CATCHMENTS,
University of New England, Armidale (Australia). Dept. of Geography.
For primary bibliographic entry see Field 4C.
W75-10647

WATERSHED BEHAVIOR AFTER FOREST FIRE IN WASHINGTON,
Forest Service (USDA), Wenatchee, Wash. Forest Hydrology Lab.
For primary bibliographic entry see Field 4C.
W75-10790

TOTAL SEDIMENT LOAD BY THE EXTRAPOLATED DATA PROCEDURE,
Agricultural Research Service, Chickasha, Okla.
P. B. Allen, and B. B. Barnes.
In: Present and Prospective Technology for Predicting Sediment Yields and Sources, USDA, Pub. No. ARS-S-40, June 1975, p 100-108, 6 fig, 1 tab, 11 ref.

Descriptors: *Sediment discharge, *Sediment transport, *Suspended sediments, *Sediment load, Sedimentation, Sediment yield, Open channel flow, Sampling, Runoff flow, Erosion, Agricultural watersheds, Measurement, Mathematical models, River flow, Water measurement, Watersheds(Basins), Computer models, Sediment distribution, Soil erosion, Velocity, Hydrology, Hydrometry.
Identifiers: *Bed-material transport, *Sediment measurement, *Sediment models.

A procedure is presented that computes bed-material transport near the streambed in the unsampled portion of a stream cross section. Its principal use is where accurate unmeasured loads are designed for addition to measured loads determined with conventional, depth-integrated, suspended sediment samples. For each computation two or three point suspended sediment samples and two or three velocity measurements must be taken below mid-depth at each of several stream verticals. Sediment concentrations by particle-size ranges and respective depths define concentration distribution equations for each vertical. Velocities and respective depths define a velocity distribution equation for each vertical. Summation of the products of respective concentration and velocity equations integrated over the unsampled depth represents sediment transport in the unsampled zone. (ARS)
W75-10847

SEDIMENT-YIELD CHARACTERISTICS FROM UNIT SOURCE WATERSHEDS,
Agricultural Research Service, Chickasha, Okla.
E. D. Rhoades, N. H. Welch, and G. A. Coleman.
In: Present and Prospective Technology for Predicting Sediment Yields and Sources, USDA, Pub. No. ARS-S-40, June 1975, p 125-129, 2 tab.

Descriptors: *Sediment yield, *Watershed(Basins), *Rainfall, *Runoff, Range, Cropland, Gully erosion.
Identifiers: *Unit source watersheds.

Sediment yield data along with precipitation and runoff are presented for a 5-year period from four rangeland and seven cropland watersheds located in the Southern Great Plains. Two eroded grassland watersheds in poor condition produced 4.4 times more runoff and 100 times more sediment than two nearby virgin grassland watersheds in good-to-excellent condition. Sediment yield from a gully comprising less than 1 percent of the area of a poor-to-fair eroded grassland watershed produced 51 percent of all sediment from the watershed. Sediment yield from cropland watersheds was shown to be very closely associated with the cover and surface condition at the time of the runoff producing event. Very little sediment was lost from fall-sown wheat or alfalfa during the spring, however such areas were vulnerable during the fall when there was little or no ground cover. Areas that are bare during the spring are more likely to produce a major portion of the sediment during this period. (ARS)
W75-10848

2K. Chemical Processes

ORGANIC MATTER IN NATURAL WATER AND WATER TREATMENT,
New Hampshire Univ., Durham. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W75-10351

DETERMINATION OF CADMIUM, COPPER, AND LEAD IN NATURAL WATERS AFTER ANION-EXCHANGE SEPARATION,
Vienna Univ., (Austria).
For primary bibliographic entry see Field 5A.
W75-10385

DETERMINATION OF MANGANESE IN NATURAL WATERS BY ATOMIC ABSORTION SPECTROMETRY WITH A CARBON TUBE ATOMIZER,
Kyoto Univ. (Japan).
For primary bibliographic entry see Field 5A.
W75-10386

NBS ADDS FOREIGN WRINKLE TO STANDARDS WORK,
For primary bibliographic entry see Field 5A.
W75-10490

ATOMIC ABSORPTION SPECTROMETRIC DETERMINATION OF CADMIUM, LEAD, SILVER, THALLIUM AND ZINC IN SILICATE ROCKS BY DIRECT ATOMIZATION FROM THE SOLID STATE,
Oslo Univ. (Norway). Dept. of Chemistry.
F. J. Langmyhr, J. R. Stubergh, Y. Thomassen, J. E. Hanssen, and J. Dolezal.
Analytica Chimica Acta, Vol 71, No 1, p 35-42, July 1974. 4 tab, 12 ref.

Descriptors: Analytical techniques, *Spectroscopy, *Rocks, *Heavy metals, Cadmium, Lead, Zinc, Silicates, Inorganic compounds, Instrumentation, Laboratory tests, Testing procedures, Pollutant identification, Chemical analysis.
Identifiers: *Atomic absorption spectroscopy, Silver.

Atomic absorption spectrometric methods were described for the determination of cadmium, lead, silver, thallium and zinc in some international and other silicate rocks. The metals were atomized directly from the solid samples in a graphite furnace. The data were compared with results obtained by atomizing solutions in the flame, in the graphite furnace, and with earlier data. Measurements were made with a Perkin-Elmer 303 atomic absorption spectrophotometer equipped with a deuterium arc source background corrector. The data obtained compare favorably with recent analysis by the absorption tube technique and with activation analysis. For most samples measured by X-ray spectrography and this atomic absorption method agreement was satisfactory. Considering the low levels of lead, the proposed method can be classified as moderately precise. (Jernigan-Vanderbilt)
W75-10492

DETERMINATION OF NICKEL IN ROCKS AFTER EPITHERMAL NEUTRON ACTIVATION,
Institutt for Atomenergi, Kjeller (Norway). Isotope Labs.
E. Steinnes.
Analytica Chimica Acta, Vol 68, No 1, p 25-30, January 1974. 2 tab, 21 ref.

Descriptors: *Nickel, *Analytical techniques, *Rocks, Standards, *Neutron activation analysis, Spectroscopy, Radioisotopes, Chemical reactions, Testing procedures, Instrumentation, Pollutant identification, Silicates, Chemical analysis.

Nickel was determined in seven U.S. Geological Survey standard rocks by reactor activation analysis based on the Ni58(n,p)Co58 reaction. The purpose of the work described was to extend this method down to lower concentration levels in order to see how good determinations could be performed either by purely instrumental analysis or with radiochemical separation of Co58 - Co60. An additional goal was to attempt a contribution to the improvement of nickel data on the U.S. Geological Survey standard silicate rocks. The data obtained were compared with previous literature values. The method was applicable to most geological samples. (Jernigan-Vanderbilt)
W75-10493

URANIUM, THORIUM, AND LEAD CONCENTRATIONS IN THREE SILICATE STANDARDS AND A METHOD OF LEAD ISOTOPIC ANALYSIS,
Geological Survey, Denver, Colo.
M. Tatsumoto, R. J. Knight, and M. H. Delevaux.
U.S. Geological Survey, Professional Paper 800-D, p D111-115, 1972. 5 tab, 15 ref.

Descriptors: *Lead, *Heavy metals, *Analytical techniques, *Silicates, *Rocks, Mineralogy, Isotope studies, Testing procedures, Isotope fractionation, Radioactivity techniques, Pollutant identification, Chemical analysis.

Isotope dilution analyses of uranium, thorium, and lead in two U.S. Geological Survey rock standards, BCR-1 and AGV-1 and those in a National Aeronautics and Space Administration (NASA) basalt (from Knippa, Tex.) standard showed that concentrations in BCR-1 are 1.73 ppm U, 5.99 ppm Th, and 13.56 ppm Pb, in AGV-1 are 1.96 ppm U, 6.27 ppm Th and 36.53 ppm Pb, and in NASA basalt are 1.87 ppm U, 6.42 ppm Th, and 5.13 ppm Pb. A comparison of lead contents for BCR-1 and the original split indicates that the standard is contaminated by lead; however, homogeneity of the sample has been established and variation of the concentration is less than 1 percent. A new technique for isotopic analysis of lead, the silica gel-phosphate method, was tested for analytical uncertainties. The lead isotopic composition for BCR-1 obtained by the method using double-spike fractionation correction is Pb 206/Pb204 = 18.794, Pb 207/Pb 204 = 15.610, and Pb 208/Pb 204 = 38.660. (Jernigan-Vanderbilt)
W75-10494

FAST SEPARATION OF TIN (IV) FROM TIN (II) AND FROM NUMEROUS METAL IONS ON ION-EXCHANGE PAPERS,
Tabriz Univ. (Iran). Analytical Lab.
W. Husain, and M. Gulabi.
Separation Science, Vol 6, No 5, p 737-739, October 1971. 2 tab, 7 ref.

Descriptors: *Separation techniques, *Tin, *Cations, *Chromatography, Ions, Ion-exchange, Solvents, Analytical techniques, Metals, Pollutant identification, Chemical analysis.

A fast method for the separation of tin(IV) and tin(II) was developed on titanic tungstate ion-exchange papers. To develop a suitable method of separation, a large number of solvent systems were tried. A mixture of 0.5M ammonium acetate and 0.1M acetic acid in the volume ratio 2:1 was the most suitable solvent system for fast separations. Tin(IV) could also be separated from 40 other cations on the papers in only 20 minutes. (Jernigan-Vanderbilt)
W75-10497

SPECTROSCOPIC DETERMINATION OF ATOMIZATION EFFICIENCY (CUCL-CU+CL) IN AN AIR-HYDROGEN FLAME,
Nagoya Univ. (Japan). Dept. of Synthetic Chemistry.
K. Kitagawa, M. Yanagisawa, and T. Takeuchi.
Analytica Chimica Acta, Vol 68, No 1, p 212-216, January 1974. 1 tab, 4 fig, 6 ref.

Descriptors: *Analytical techniques, *Copper, Efficiencies, *Flame photometry, Spectroscopy, Chemical reactions, Laboratory tests, Testing procedures, Pollutant identification, Chemical analysis.

An equation for the comparison of ionic and atomic lines in determining the atomization efficiency of absorption spectrometry was derived. In the experimental work, a solution of copper (II) chloride was sprayed into an air-hydrogen flame supported by a Beckman burner, and two atomic copper lines and a CuCl line consisting of many rotational lines were observed. The atomization efficiency was 70-90% in the temperature range of 1,700-2,200 K. The high excitation temperature did not cause high atomization efficiencies which suggests that atoms obtain energy after dissociation, and that the excitation temperature is not necessarily consistent with translational, vibrational, or rotational phenomena in the diffusion flame. The method is valid for most experimental purposes with an advantage that no reaction equilibrium is assumed. (Jernigan-Vanderbilt)
W75-10498

RAPID EXTRACTIVE SPECTROPHOTOMETRIC DETERMINATION OF GOLD (III) WITH 4-(2-PYRIDYLAZO)- RESORCINOL,
Indian Inst. of Tech., Bombay. Dept. of Chemistry.
S. G. Nagarkar, and M. C. Eshwar.
Analytica Chimica Acta, Vol 71, No 2, p 461-463, August 1974. 1 fig, 1 tab, 11 ref.

Descriptors: *Spectrophotometry, *Gold, *Analytical techniques, Testing procedures, Separation techniques, Statistics, Pollutant identification.

A method for the determination of gold (III) is described that compared favorably in accuracy and sensitivity with other methods, and took less than 20 min. for extraction and determination. The relative standard deviation, calculated from 10 determinations with 240 micrograms of gold(III) in 25 ml was plus or minus 1.10%. The effects of reagent concentration and acidity, tartaric or citric acid, and nonaqueous solvent and stability were discussed. The complex showed maximal absorbance at 540 nm. Beer's law was obeyed in the concentration range 3.5-18 micrograms Au(III) per ml. The interference of about 40 ions was studied for solutions containing 9-60 micrograms Au(III) per ml. (Pulliam-Vanderbilt)
W75-10499

ERROR ANALYSIS OF DOBSON SPECTROPHOTOMETER MEASUREMENTS OF THE TOTAL ATMOSPHERIC OZONE CONTENT,
National Aeronautics and Space Administration, Wallops Island, Va. Wallops Station.
For primary bibliographic entry see Field 7B.
W75-10545

WATER FOR INDUSTRIAL DEVELOPMENT IN ALCORN, ITAWAMBA, PRENTISS, AND TISHOMINGO COUNTIES, MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 3E.
W75-10581

HYDROGEOLOGY OF THE TRIASSIC ROCKS OF MARYLAND,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 2F.
W75-10584

HYDROLOGIC RECONNAISSANCE OF THE SOUTHERN UINTA BASIN, UTAH AND COLORADO,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 3B.
W75-10585

INDEX TO WATER RESOURCES DATA FOR LOUISIANA: SURFACE WATER RECORDS; WATER-QUALITY RECORDS.
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 5A.
W75-10590

HYDROLOGICAL DATA FROM WELLS IN SOUTHWEST HILLSBOROUGH COUNTY, FLORIDA, 1950-74,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W75-10593

A RIVER-QUALITY ASSESSMENT OF THE UPPER WHITE RIVER, INDIANA,
Geological Survey, Indianapolis, Ind.
For primary bibliographic entry see Field 5B.
W75-10600

TEMPERATURES OF WYOMING STREAMS,
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 7C.
W75-10604

A THEORY OF THE MASS TRANSPORT OF PREVIOUSLY DISTRIBUTED CHEMICALS IN A WATER-SATURATED SORBING POROUS MEDIUM: 4. DISTRIBUTIONS,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 5B.
W75-10632

TRACE ELEMENTS IN MELBOURNE RIVERS - AN INTERLABORATORY ANALYSIS,
Materials Research Labs., Melbourne (Australia).
For primary bibliographic entry see Field 5A.
W75-10649

WATER ANALYSIS OF RIVER WATERS IN KAGAWA (IX), CHEMICAL COMPOSITION OF THE AYA WATER BASIN, (IN JAPANESE),
T. Itoyama.
Kagawa Daigaku Kyoiu Gakubu Kenkyu Hokoku, (Mem. Fac. Educ., Kagawa Univ.), Vol 2, No 230, p 1-7, 1974. 1 fig, 11 tab, 7 ref.

Descriptors: *Analytical techniques, *Groundwater, *Rivers, *Chemical analysis, Geochemistry, Calcium, *Pollutant identification, *Hardness(Water), Chlorides, Chemical oxygen demand, Silica.
Identifiers: *Aya Water basin(Japan).

The differences in chemical composition of the groundwater and river water of the Aya Water basin, Japan, were investigated between May 1969 and January 1970. In the upper mountaneous district of the Aya Water basin, all measurements of chemical composition, including total hardness, Ca hardness, Cl, SiO2, and total residue, except for COD, were higher in the groundwater than in the river water. The weight ratios, groundwater to river water, total residue to total hardness, and Ca hardness to Cl hardness, were determined. Fluctuation of values of the chemical composition during a given year were also studied. (Prague-FIRL)
W75-10841

2L. Estuaries

HEAVY METAL CONTENTS OF FISHES CAUGHT IN KAOHSIUNG HARBOR, (IN CHINESE),
National Taiwan Univ., Taipei. Inst. of Oceanography.
For primary bibliographic entry see Field 5A.
W75-10430

LABORATORY MEASUREMENT OF SURFACE TEMPERATURE FLUCTUATIONS INDUCED BY SMALL AMPLITUDE SURFACE WAVES,
TRW Systems Group, Redondo Beach, Calif. Engineering Sciences Lab.
J. H. Chang, and R. N. Wagner.
Journal of Geophysical Research, Vol 80, No 18, p 2677-2687, June 20, 1975. 14 fig, 6 ref. Navy Prime Contract 00017-72-C-4401.

Descriptors: *Ocean waves, *Water temperature, *Radiation, *Analytical techniques, *Laboratory tests, Heat transfer, Diffusion, Thermal radiation, Boundary processes, Thermal conductivity.
Identifiers: *Infrared radiometer, Monochromatic surface waves.

Convergent or divergent flows on a cooled ocean surface can induce surface temperature fluctuations. This effect is important for the interpretation of infrared radiation from the ocean. Laboratory experiments under controlled conditions were conducted to measure surface temperature fluctuations induced by surface waves whose dynamic characteristics could also be measured. The surface waves were produced in the laboratory. An infrared radiometer was used to measure the temperature changes. The major experimental task was to discriminate between the thermal and reflectance contributions to the wave-induced total radiometric signal. A technique to measure the upper bound of the reflectance contribution was developed, validated, and implemented. The magnitude of measured temperature fluctuations induced by small monochromatic surface waves agreed well with predictions from linear theories. In the linear wave dynamic regime the amplitude of the wave-induced temperature fluctuation is dependent on the near-surface heat transfer. This dependence was found to be linear by systematically increasing the surface heat transfer by means of an increase in wind velocity. (Singh-ISWS)
W75-10505

TOWARD AN ICE-FREE ARCTIC OCEAN,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 2C.
W75-10532

ON THE JOINT DISTRIBUTION OF THE PERIODS AND AMPLITUDES OF SEA WAVES,
National Inst. of Oceanography, Wormley (England).
M. S. Longuet-Higgins.
Journal of Geophysical Research, Vol 80, No 18, p 2688-2694, June 20, 1975. 7 fig, 1 tab, 10 ref.

Descriptors: *Ocean waves, *Fluctuations, *Frequency, *Distribution, *Probability, *Gulf of Mexico, Energy, Histograms, Mathematical studies, Data collections, Statistical methods, Theoretical analysis.
Identifiers: Joint probability density, Marginal density, Wave theory.

A theoretical expression for the joint distribution of wave period and amplitude, which was previously derived for a Gaussian record with a narrow spectrum, was restated in simple form. According to this distribution, the variability of wave periods for waves of a given height is inversely proportional to the wave height and the higher waves tend to be more regular. The distribution was found to agree well with observations of wave periods and amplitudes from the Gulf of Mexico. In shallow water, especially for steep waves, the distribution can be expected to be less applicable because of the enhanced nonlinearity. (Singh-ISWS)
W75-10534

WAVE CLIMATE MODEL OF THE MID-ATLANTIC SHELF AND SHORELINE (VIRGINIAN SEA), MODEL DEVELOPMENT, SHELF GEOMORPHOLOGY, AND PRELIMINARY RESULTS,
Virginia Inst. of Marine Science, Gloucester Point.
V. Goldsmith, W. D. Morris, R. J. Byrne, and C. H. Whitlock.
Available from the National Technical Information Service, Springfield, Va 22161 as NASA-SP-358, $6.25 in paper copy, $2.25 in microfiche. NASA SP-358 and VIMS SRAMSOE No. 38, 1974. 146 p, 13 fig, 5 tab, 162 ref, 2 append.

Descriptors: *Waves(Water), *Ocean waves, *Model studies, *Atlantic Ocean, *Continental shelf, Coasts, Shallow water, Shores, Geomorphology, Mathematical models, Mathematical studies, Shoals.
Identifiers: *Virginian Sea.

A description was presented of the development and preliminary results of the Wave Climate Model of the Mid-Atlantic Continental Shelf and Shoreline (Virginian Sea), a joint effort of the Virginia Institute of Marine Science and the Langley Research Center. A review of the shelf geomorphology was also presented because the most important influence on the wave climate of this shelf is the interaction between the ocean waves and the various shelf relief elements. The Virginian Sea Wave Climate Model differs from previous models in the following important elements: (1) The model covers a very large geographic area of the continental shelf and shoreline, Cape Henlopen, Delaware, to Cape Hatteras, North Carolina, an area of 20,000 square nautical miles within a single large grid. (2) Distortions due to flat representations of the spherical Earth and problems resulting from the fact that waves travel great circle paths were overcome by constructing a Transverse Mercator map projection tangent to the Earth along the center of the grid. (3) An improved understanding of wave behavior in the area of crossed wave rays is now available from theoretical studies. (Sims-ISWS)
W75-10552

SOME FEATURES OF TSUNAMIS ON THE PACIFIC COAST OF SOUTH AND NORTH AMERICA,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
T. S. Murty, S. O. Wigen, and R. Chawla.
Manuscript Report Series No. 36, 1975. 37 p, 9 fig, 9 tab, 14 ref.

Descriptors: *Tsunamis, *Pacific Ocean, *North America, *South America, Ocean waves, Tides, Coasts, Inlets(Waterways), Bays, Estuaries, Water circulation, Oceans, Oceanography, Resonance.
Identifiers: *Secondary undulations.

In order to investigate the response of inlets to tsunamis, the resonance characteristics of some inlets on the coast of Chile were deduced through simple analytical considerations. A comparison was made with the inlets of southeast Alaska, the mainland coast of British Columbia, and Vancouver Island. It was shown that the general level of intensity of secondary undulations is highest for Vancouver Island inlets, and least for those of Chile and Alaska. It was also shown that tsunami forerunners are more common than is generally believed. (Sims-ISWS)
W75-10554

SEDIMENT CHARACTERISTICS OF STREAMS IN THE EASTERN PIEDMONT AND WESTERN COASTAL PLAIN REGIONS OF NORTH CAROLINA,
Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 2J.
W75-10586

THE LOXAHATCHEE - A RIVER IN DISTRESS, SOUTHEAST FLORIDA,
Geological Survey, Miami, Fla.
For primary bibliographic entry see Field 4C.
W75-10588

ADDITIONAL STUDIES OF THE FISHES, MACROINVERTEBRATES AND HYDROLOGICAL CONDITIONS OF UPLAND CANALS IN TAMPA BAY, FLORIDA,
National Marine Fisheries Service, St. Petersburg, Fla. Southeast Region.
For primary bibliographic entry see Field 5C.
W75-10617

NORTON POINT DIKE STUDY, CONEY ISLAND, NEW YORK; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W75-10662

LOS ANGELES AND LONG BEACH HARBORS MODEL STUDY; REPORT 2, OBSERVATIONS OF SHIP MOORING AND MOVEMENT,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W75-10664

THE PERIMETER CANAL - A NEW APPROACH TO DISCHARGE URBAN WATER INTO A COASTAL MANGROVE AREA,
Greiner (J.E.) Co., Inc., Tampa, Fla.
For primary bibliographic entry see Field 4A.
W75-10773

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

LIQUEFYING REFRIGERANT FOR WATER DESALINATION WITH LIQUEFIED NATURAL GAS AND AN INTERMEDIATE ENERGY CYCLE,
Nuovo Pignone S.p.A., San Donato Milanese (Italy). (assignee)
A. Antonelli.
US Patent No 3,892, 103, 7 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 936, No 1, p 47, July 1, 1975.

Descriptors: *Patents, *Desalination, *Desalination processes, *Water purification, Water treatment, Sea water, Refrigeration, Heat exchangers, Electric power, Equipment, Turbines, *Waste water treatment.
Identifiers: Compressors, Liquified natural gas(LNG).

A process is disclosed for producing desalted water in which liquified natural gas is converted to the vapor state and refrigeration units are released and transferred to a high hydrocarbon in the vapor state which is converted to the liquid state and then delivers the refrigeration units necessary for desalination to the water. The closed refrigerant fluid circuit includes a heat exchanger for the absorption of refrigeration units from the liquified natural gas, a boiler for the absorption of heat from the higher hydrocarbons, a superheater for the transfer of heat from a source such as water to the refrigerant fluid, and a turbine through which energy in the heated refrigerant fluid may be delivered to a compressor for the higher hydrocarbon. (Sinha-OEIS)
W75-10725

ROTARY DESALINATION ENGINE AND SYSTEM,
Frontier Engineering Corp., Houston, Tex.; and Zachry (H. B.) Co., San Antonio, Tex. (assignees)
E. Schnitzer.
U.S. Patent No. 3,890,205, 9 p, 9 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 935, No 3, p 1200, June 17, 1975.

Descriptors: *Patents, *Desalination, *Desalination apparatus, *Water purification, *Water quality control, Separation techniques, Heat exchangers, Heating, Condensation, Dissolved solids, Seawater, Brackish water, Polluted water, Potable water, Waste water treatment.
Identifiers: Rotary heat exchangers.

A rotary heat exchanger device is disclosed for transferring heat energy between two fluids. The device utilizes one or more high speed, thin rotating discs as heat transfer surfaces between such fluids as a boiling and a condensing fluid. The disc or discs are rotated at such high speed that the extreme centrifugal force of hundreds of times the force of gravity reduces the insulating liquid film to a micro-thin liquid film wherein greatly improved heat transfer coefficients are obtained. Provided in the rotating disc chamber housing is a centrifugal liquid seal to separate the boiling and condensing chambers which is combined with a naturally pressurized fluid discharge at the disc periphery. The rotary heat exchanger device also incorporates other components such as an easily cleanable tri-liquid counterflow spiral heat exchanger and degasser devices to prevent dissolved gas from accumulating in and blocking the purifying system. (Sinha-OEIS)
W75-10733

3B. Water Yield Improvement

LAND USE SIMULATION MODEL OF THE SUBALPINE CONIFEROUS FOREST ZONE,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
C. F. Leaf, and G. E. Brink.
Research Paper RM-135, 42 p, February 1975. 9 fig, 16 ref, 5 tab.

Descriptors: *Computer models, *Simulation analysis, *Forest management, Hydrology, Watershed management, *Land use, *Weather modification, *Lumbering, Evapotranspiration, Soil water, Snow cover, *Coniferous forests, Water yield, Water yield improvement, Watersheds(Basins), Interception, Sediment yield, Clear-cutting.
Identifiers: Forest cover.

A dynamic model simulates the short- and long-term hydrologic impacts of combinations of timber harvesting and weather modification to develop management strategies for planning intervals which can vary from a few years to the rotation age of subalpine forest (120 years and longer). Management strategies may subdivide a given planning unit, defined by environmental characteristics, into as many as eight distinct response units, which may be managed independently. Different cutting practices may be imposed on the response units, and any number of cuttings can be made at specified years during the planning interval. All interactions between the various response units are accounted for in both time and space. Moreover, the model contains time trend functions which computer changes in evapotranspiration, soil water, forest cover density, reflectivity, interception, snow redistribution, and sediment yield as the forest stands respond to timber harvesting. (Witt-IPC)
W75-10404

WATERSHED MANAGEMENT IN THE ROCKY MOUNTAIN SUBALPINE ZONE: THE STATUS OF OUR KNOWLEDGE,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
C. F. Leaf.
Research Paper RM-137, 31 p, February 1975. 18 fig, 77 ref, 9 tab.

Descriptors: *Forest management, *Watershed management, *Water yield, *Reviews, Simulation analysis, *Rocky Mountain Region, Wyoming, Colorado, New Mexico, Snow cover, Snowmelt, Runoff forecasting, Lumbering, Weather modification, Water supply, Land use, Model studies, Watersheds(Basins), Water sources, Mountains, Water yield improvement, Land use.
Identifiers: Subalpine watersheds.

Watershed management in the subalpine zone of Wyoming, Colorado, and New Mexico is described. Forest hydrology is briefly discussed, followed by an in-depth discussion and review of field studies of the effects of watershed management practices on snow accumulation, melt, and subsequent runoff; and simulation models designed to predict the hydrologic impacts of timber harvesting and weather modification. Pertinent literature is included, along with unpublished research, observations, and experience. Research needs are highlighted, and guidelines for implementing watershed management principles in land use planning are summarized. (Witt-IPC)
W75-10405

SIMULATING TIMBER YIELDS AND HYDROLOGIC IMPACTS RESULTING FROM TIMBER HARVEST ON SUBALPINE WATERSHEDS,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
C. F. Leaf, and R. R. Alexander.
Research Paper RM-133, 20 p, February 1975. 9 fig, 17 ref, 11 tab.

Descriptors: *Computer models, *Forest management, *Watershed management, *Water yield, Hydrology, Simulation analysis, Rocky Mountain Region, Snow cover, Snowpacks, Snowmelt, Runoff forecasting, Solar radiation, Model studies, Water supply, Lumbering, Watersheds(Basins), Water sources, Mountains, Water yield improvement.
Identifiers: *Timber yield, Subalpine watersheds.

A dynamic simulation model which has been specifically designed to determine the hydrologic changes resulting from timber harvesting and correlary models which simulate timber yields are described. Emphasis is placed on the planning unit which is defined by environmental characteristics, including combinations of slope, aspect, elevation, and forest cover. The models are intended for use on subalpine watersheds where the primary source of streamflow is from melting snow. The hydrologic model simulates winter snow accumulation, the short- and longwave radiation balance, snowpcake condition, snowmelt, and subsequent runoff in time and space. The timber models simulate projected timber yields in response to changes in cultural treatments and/or variations in original stand and site conditions. The models have been used to simulate the effects of forest and watershed management on several representative drainage basins in the Rocky Mountain Region of the United States. Projected hydrologic changes and growth and yield subsequent to timber harvesting in lodgepole pine and spruce-fir are described. (Witt-IPC)
W75-10406

HYDROLOGIC RECONNAISSANCE OF THE SOUTHERN UINTA BASIN, UTAH AND COLORADO,
Geological Survey, Salt Lake City, Utah.
D. Prince, and L. L. Miller.
Utah Department of Natural Resources, Salt Lake City, Technical Publication No 49, 1975. 66 p, 11 fig, 3 plate, 15 tab, 38 ref.

Descriptors: *Water resources development, *Groundwater resources, *Surface water availability, *Utah, *Colorado, Hydrologic data, Hydrologic cycle, Water importing, Water utilization, Irrigation, Water yield, Water quality, Arid climates, Semiarid climates.
Identifiers: *Southern Uinta basin(Utah and Colo).

The southern Uinta Basin covers about 4,900 square miles in northeastern Utah and northwestern Colorado. For the most part, it is an arid to semiarid region. During the period 1941-70, average annual precipitation ranged from less than 8 inches in the north-central part to more than 26 inches in the extreme western part. The area averages about one person for every 4.5 square miles. It is utilized mainly for livestock grazing and the production of oil and gas. Net imports of water from the Duchesne River for irrigation within the southern Uinta Basin average about 70,000 acre-feet per year as of 1972. About 94% of the average annual water supply from precipitation and imports is consumed within the southern Uinta Basin by evapotranspiration and sublimation from the winter snowpack. Both the surface water and groundwater are saline throughout a major part of the basin. Only in the headwater areas along the south rim of that subbasin can fresh water generally be found. The most promising opportunities for obtaining large sustained water supplies are surface reservoir storage of runoff in the headwaters of the larger streams. (Woodard-USGS)
W75-10585

PROGRESS IN AUSTRALIAN HYDROLOGY 1965-1974.
For primary bibliographic entry see Field 2A.
W75-10646

WATERSHED MANAGEMENT PROBLEMS AND OPPORTUNITIES FOR THE COLORADO FRONT RANGE PONDEROSA PINE ZONE: THE STATUS OF OUR KNOWLEDGE,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4D.
W75-10655

WATER-YIELD IMPROVEMENT FROM ALPINE AREAS: THE STATUS OF OUR KNOWLEDGE,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
M. Martinelli, Jr.
Research Paper RM-138, March 1975. 16 p, 12 fig, 1 tab.

Descriptors: *Alpine, *Snow management, *Water yield improvement, *Snowpacks.
Identifiers: Snow fences, Blowing snow, Snow accumulation.

Snowpack management can be effective means of improving water yields from the already productive alpine type. Snow accumulates in the lee of terrain breaks, and fences upwind of natural accumulation areas effectively trap additional snow. Snowfences can also control blowing and drifting snow on highways and in avalanche-prone areas. (Forest Service)
W75-10660

ESTIMATING THE TRANSPORT AND EVAPORATION OF BLOWING SNOW,
Forest Service (USDA), Laramie, Wyo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2C.
W75-10695

PRIORITY PROBLEMS FOR MODIFYING CUMULUS PRECIPITATION,
Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
L. O. Grant.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York p 131-146, 1974. 2 tab, 10 ref.

Descriptors: *Precipitation(Atmospheric), *Weather modification, *Clouds, Artificial precipitation, Research priorities, Cloud seeding, Cloud physics, Meteorology, Precipitable water.
Identifiers: *Cumulus precipitation.

Cumulus clouds are extremely complex. It seems unlikely that the model calculated and field demonstrated seeding effects of individual small cumuli can substantially alter the areal precipitation, at least on the High Plains. High priority scientific problems in the development of a technology of cumulus modification for augmentating precipitation include: (1) a lack of detailed observational description of individual clouds and of cloud interactions, (2) the absence of cloud model verifications and evaluations, (3) a lack of understanding of cloud interactions with their environment and with each other, and (4) the complexity of developing an experimental design for conducting cumulus seeding experiments. (See also W75-10769) (Humphreys-ISWS)
W75-10774

WEATHER MODIFICATION FOR USE IN THE HIGH PLAINS,
South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
R. A. Schleusener, and J. R. Miller, Jr.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 147-164, 1974. 9 fig, 3 tab, 11 ref. DOI 14-06-D-6796, 14-06-D-6660, NOAA N 22-188-72(N).

Descriptors: *Weather modification, *Cloud seeding, *Decision making, *South Dakota, Artificial precipitation, Water supply, Precipitation(Atmospheric), On-site investigations, Technology, Projects, Clouds, Rainfall, Hail, Insurance, Storms, Cloud seeding, *Great Plains.
Identifiers: *Hail suppression, *High Plains.

The development and extent of use of weather modification in the High Plains were examined. Data presented were in the nature of a progress report. The decision processes involved in a scientific experiment and in a users' decision to utilize weather modification were contrasted. The extent of use of weather modification and the basis for decisions made to use weather modification in the Plains were examined. Weather modification was being used in 28 projects in 6 states in the summer of 1973 in the Plains. Research results on seeding for rain increase give statistically significant rainfall increases for individual clouds less than 30,000 ft in depth, suggest rainfall increases for areas of about 1000 sq mi, and are non-existent for areas in the Plains larger than 10,000 sq mi. Research results on seeding for hail suppression over the north central Plains suggest hail suppression of about 50% and provide an adequate basis for some user groups to proceed with applied programs. Improved methods are needed to evaluate applied projects. Future needs require reduction of scientific uncertainties and ability to respond to user needs within the constraints imposed by society. (See also W75-10769) (Humphreys-ISWS)
W75-10775

USERS' VIEW OF WEATHER MODIFICATION,
Kansas State Senate, Topeka. 39th District.
D. Christy.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 165-170, 1974.

Descriptors: *Weather modification, *Cloud seeding, *Artificial precipitation, *Kansas, Benefits, Legal aspects, Droughts, Precipitation(Atmospheric), Agriculture, Meteorology.

The writer's experience with weather modification efforts in Kansas were reviewed. It was concluded that weather modification is valid, that hail suppression has a good probability of being justified, and that there is a lot to learn. It was suggested that during the developing years, attempts at weather modification should be instituted by citizens as they have been in the past. As public support develops, permissive type of legislation should be instituted so that state government could help when an area wants the modification bad enough to do something about it. National research should continue with more emphasis on the command type of 'Break the Drought' applications. (See also W75-10769) (Sims-ISWS)
W75-10776

ROLE OF THE PUBLIC IN WEATHER MODIFICATION,
Colorado State Univ., Fort Collins.
A. R. Chamberlain.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 171-177, 1974.

Descriptors: *Weather modification, *Cloud seeding, *Social participation, Decision making, Public rights, Economics, Social aspects, Precipitation(Atmospheric), Rainfall.
Identifiers: *Public involvement.

Weather modification is too important for the major decisions to be left to the scientists and engineers. The lay citizen is supportive of but not interested in seeking involvement in laboratory research or in small scale field research experiments conducted with the knowledge of a small group of very local people. As the scientist and engineer move along an activity spectrum toward development and operations, the role and interest of the public increases very markedly. The scientists and engineers who have missed this point quickly find themselves cast into adversary relationships and conflict with the public and numerous consumer and environmental organizations. Frequently years of delay result. There delays can be avoided or reduced if we begin both to apply better decision models that bring scientist and public together in the formative stage of a project and to initiate more effort to develop social system decision making techniques that can accommodate quality, value, and other unmeasurable but definable items. (See also W75-10769) (Sims-ISWS)
W75-10777

3C. Use Of Water Of Impaired Quality

WATER REUSE IN A PAPER REPROCESSING PLANT,
Oklahoma Univ., Norman. School of Civil Engineering and Environmental Science.
For primary bibliographic entry see Field 5D.
W75-10401

WATER-SOIL-PLANT INTERACTIONS WITH TERBACIL,
Hawaii Univ.-Hilo Coll., Hilo.
For primary bibliographic entry see Field 5C.
W75-10486

PHOSPHORUS IN PERCOLATES FROM MANURED LYSIMETERS,
Guelph Univ. (Ontario). Dept. of Land Resource Science.
For primary bibliographic entry see Field 5B.
W75-10573

WELLTON-MOHAWK DRAINAGE AND THE MEXICAN SALT PROBLEM,
Wellton-Mohawk Irrigation and Drainage District, Ariz.
For primary bibliographic entry see Field 4A.
W75-10783

UTILIZATION OF SEWAGE EFFLUENT FOR IRRIGATION,
For primary bibliographic entry see Field 5D.
W75-10798

IRRIGATION MANAGEMENT FOR SALT CONTROL,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
J. Van Schilfgaarde, L. Bernstein, J. D. Rhoades, and S. L. Rawlins.
In: Agricultural and Urban Considerations In Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 647-672, 1974. 8 fig, 5 tab, 24 ref, 1 append.

Descriptors: *Irrigation, *Salts, *Salt tolerance, *Leaching, Crops, Irrigation practices, Adoption of practices, Irrigation programs, Rates of application, Infiltration rates, Irrigation efficiency, Irrigation water, Water quality, Salinity, Salt balance, Management, Lysimeters, Drainage, Agriculture.

It has been known for generations that, for irrigation agriculture to remain viable over time, sufficient drainage must be provided to avoid an adverse salt buildup in the soil. Irrigation agriculture can operate successfully without the attainment of salt balance, by irrigating with the lowest leaching fractions possible commensurate with satisfactory crop growth. Research and modeling studies at the U.S. Salinity Laboratory have verified that minimizing the leaching fractions reduces the return of applied salts in the return flow and minimizes river and groundwater pollution. It maximizes the precipitation of carbonate and gypsum minerals in the soil; it minimizes soil mineral weathering and the dissolution of salt previously deposited in the soil; and it reduces the salt pickup from deeper underground sources. Plant tolerance data leads to the conclusion that each crop exhibits a typical level of soil water salinity above which the plant cannot concentrate the water and below which one can expect essentially full yield. It was shown that these critical levels of salinity are substantially higher than the commonly accepted 50% yield reduction values. From soil physics considerations, it was found that with frequent and uniform irrigation the bulk of the root zone can be maintained at relatively high water contents, while the deep percolation rate is kept very low. Thus, an irrigation management system can be visualized that, compared to conventional practice, reduces the volume of water applied, the quantity of salt discharged, and the drainage volume, while maintaining crop yields. (See also W75-10769) (Sims-ISWS)
W75-10800

TRICKLE IRRIGATION DESIGN REQUIREMENTS FOR ROW CROPS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 3F.
W75-10801

PROBLEMS OF WATER QUALITY MANAGEMENT IN WESTERN RIVER BASIN SYSTEMS,
California Univ., Los Angeles. Coll. of Engineering.
For primary bibliographic entry see Field 5G.
W75-10804

EFFECT OF AGRICULTURAL USE ON WATER QUALITY FOR DOWNSTREAM USE FOR IRRIGATION,
Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering.
For primary bibliographic entry see Field 5G.
W75-10805

3D. Conservation In Domestic and Municipal Use

FLOOD HAZARDS IN THE SEATTLE-TACOMA URBAN COMPLEX AND ADJACENT AREAS, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 7C.
W75-10580

HYDROLOGIC DATA FOR URBAN STUDIES IN THE FORT WORTH, TEXAS METROPOLITAN AREA, 1973,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W75-10596

VALLEY DESIGN IN URBAN GROWTH CENTRES,
University of New South Wales, Kensington (Australia). Faculty of Military Studies.
For primary bibliographic entry see Field 6B.
W75-10643

ON THE PEAK-LOAD PRICING OF URBAN WATER SUPPLY,
Clark Univ., Worcester, Mass. Graduate School of Geography.
For primary bibliographic entry see Field 6C.
W75-10706

WATER RATES: AN ASSESSMENT OF CURRENT ISSUES,
California Univ., Berkeley.
For primary bibliographic entry see Field 6C.
W75-10707

THE EFFECTS OF URBANIZATION ON FLOODS OF DIFFERENT RECURRENCE INTERVAL,
University Coll., London (England). Dept. of Geography.
For primary bibliographic entry see Field 4C.
W75-10709

THE MASTER PLAN FOR WATER-SUPPLY IN THE REGIONAL MUNICIPALITY OF OTTAWA-CARLETON,
Ottawa-Carleton Regional Municipality, Ottawa (Ontario).
F. E. Ayers.
Journal of the American Water Works Association, Vol 67, No 1, p 1-5, Jan 1975. 5 fig.

Descriptors: *Comprehensive planning, *Water supply development, *Water distribution(Applied), *Water demand, *Distribution systems, *Regional analysis, Hydrostatic pressure, Pressure conduits, Networks, Supply, Water storage, Water management(Applied), Water districts, Governments, Regions, Water resources development, *Canada.
Identifiers: Ottawa-Carleton Regional Municipality(Ontario-Canada), Ottawa River.

The Regional Municipality of Ottawa-Carleton, the first in Ontario, Canada, must supply and distribute water to the 425,000 residents in the cities of Ottawa and Vanier, 3 villages, and 11 townships. Two engineering firms developed short term plans based on a projected 1990 population of 635,000 and long term plans based on a population of 1,000,000 by the year 2030. Per capita consumption figures and average and maximum-day demand as well as maximum-hour demand figures were computed. The existing system which distributed purified water from the Ottawa River through three major pressure districts was studied. Network analysis was employed to find the best arrangement to integrate the central system with outlying areas presently bing served by up to 20 low capacity wells and to provide for regional growth at the same time. Additional filtration will be provided by upgrading both existing plants. Expansion plans are formulated for 6 pressure districts. To provide emergency reserves, 29.5 mil gal of additional ground reservoirs and four new 1-million-gallon elevated tanks are being added. Major mains from 24 to 60 inches in diameter are being constructed for maximum-hour demands and reservoir filling, as well as many smaller links in the distribution system. Substantial orderly construction progress is being made to serve the development of the area anticipated by the recently adopted master plan. (Herr-North Carolina)
W75-10710

FINANCING WATER WORKS,
Studley Shupert and Co., Inc., Boston, Mass.
W. P. Coues.
Journal of New England Water Works Association, Vol 87, No 3, p 207-217, Sept 1973.

Descriptors: *Bond issues, *Interest rates, Debt, Capital, Repayment contracts, Economics, Planning, *Financing, Investment, Financial feasibility, Return(Monetary), *Water works, Public utilities, Utilities.

General advice and instructions are given on procedures and financial obligations which a water utility should consider before selling bonds to raise money for improvements. The author, an investment counselor, considers the problem of bond financing for water works from both the perspective of the the utility and of the investor. Prevailing national business and economic conditions in the fall of 1972 are reviewed and short-range forecasts are offered for prospects of the money market, which must be considered by local authorities attempting to sell bonds. Since water utilities traditionally have had stable earnings, particularly where sales are to residential and commercial customers, investors in utility revenue bonds are more interested in the financial status of the community and less concerned about the specifics of its water utility plant and operation. They seek solidly based, professionally organized and formulated bond offerings. Professional assistance from bankers and legal counsel is urged, with special emphasis on seeking legal advice from a firm specializing in bond financing. Lists of specific procedures to be followed or avoided are offered, as well as a description of the characteristics of ideal financial conditions which bond dealers prefer. (Herr-North Carolina)
W75-10712

WATER WORKS IMPROVEMENTS--SPRINGFIELD, VERMONT,
Dvfresne-Henry Engineering Corp., North Springfield, Vt.
G. R. Allen.
Journal of New England Water Works Association, Vol 87, No 2, p 115-127, June, 1973. 10 fig.

Descriptors: *Distribution systems, Water distribution(Applied), *Water supply development, *Water delivery, *Hydraulic systems, *Water management(Applied), Water supply, Water wells, Water pressure, Groundwater availability, Pumps, Safe yield, Piping systems(Mechanical), *Vermont, Long-term planning
Identifiers: *Springfield(VT), Weathersfield Reservoir(VT).

After thorough engineering studies the Town of Springfield, Vermont, has improved the effectiveness of its present water distribution system and made long range plans for future growth. In 1904 the Weathersfield Reservoir was built about 4 miles north of the town. With a safe yield of 200,000 G.P.D., it delivers water from about 260 feet above the town by gravity flow. In the 1940's and '50's two well fields were drilled and a hand-started booster pump was added. But by the 1960's the pressure during peak periods was inadequate due to increased consumption and the hilly topography of the newer development. In 1967 the deficiencies were dramatized by a $2.5 million fire loss at the high school despite 3 nearby hydrants. Flow and pressure were insufficient. A two phase improvement program was designed. The first phase, to improve distribution of present supply, is essentially complete at a cost of $873,680 with $563,000 paid by a H.U.D. grant. Two concrete distribution storage reservoirs were built to level the demand peaks. Four and one half miles of transmission mains and 8 automated pumps were installed to incorporate the reservoirs into and permit maximum use of the existing system. Phase two, to provide additional supply, will not need to be implemented before 1990 when consumption is expected to exceed the improved capacity. (Herr-North Carolina)
W75-10713

DETERMINE URBAN RUNOFF THE SIMPLE WAY,
Montreal Urban Community (Quebec). Water Purification Dept.
For primary bibliographic entry see Field 2E.
W75-10716

WATER AND WASTEWATER FACILITIES FOR FLORIDA HOUSING DEVELOPMENTS,
Singer Co., Bridgeport, Conn. Water Resources Div.
For primary bibliographic entry see Field 5D.
W75-10717

WATER SUPPLY FROM RENOVATED WASTEWATER--A RESOURCE MANUAL FOR MASSACHUSETTS PLANNERS, PUBLIC OFFICIALS AND CITIZEN GROUPS.
Clark Univ., Worcester, Mass.
For primary bibliographic entry see Field 5D.
W75-10722

RIVERS IN THE CITY,
For primary bibliographic entry see Field 6B.
W75-10723

CLOSED RECYCLING SYSTEM FOR WATER PURIFICATION AND WASTE REDUCTION,
For primary bibliographic entry see Field 5D.
W75-10735

MULTIPLE CYCLE PROCESS FOR WASTEWATER PURIFICATION,
Airco, Inc., Montvale, N.J. (assignee)
For primary bibliographic entry see Field 5D.
W75-10738

ECONOMIC IMPACT OF THE CONVERSION OF WATER FROM IRRIGATION TO MUNICIPAL AND INDUSTRIAL USE IN THE RIO GRANDE BASIN OF NEW MEXICO,
New Mexico State Engineer, Santa Fe.
For primary bibliographic entry see Field 6D.
W75-10771

IMPACTS OF RURAL TO URBAN WATER USE,
Texas Office of the Governor, Austin. Water Task Force.
For primary bibliographic entry see Field 6D.
W75-10772

OPTIMAL SIZING OF URBAN FLOOD-CONTROL SYSTEMS,
Hydrologic Engineering Center, Davis Calif. Planning Analysis Branch.
For primary bibliographic entry see Field 4A.
W75-10821

3E. Conservation In Industry

THEORETICAL AND APPLIED CONCEPTS OF WATER RESOURCES FOR SOCIAL WELFARE.
Auburn Univ., Alabama. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W75-10354

THE ECONOMIC IMPACT OF MERCURY POLLUTION ON FISHERIES AND OTHER RELATED BUSINESSES AROUND PICKWICK LAKE,
Auburn Univ., Alabama. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W75-10356

INDUSTRIAL INTERDEPENDENCIES AND EXTERNAL DISECONOMIES OF WATER RESOURCES,
Auburn Univ., Alabama. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W75-10358

STUDY OF SOLID WASTE MANAGEMENT PRACTICES IN THE PULP AND PAPER INDUSTRY.
Gorham International, Inc., Maine.
For primary bibliographic entry see Field 5D.
W75-10366

REDUCTION OF EFFLUENT POLLUTION AT THE ARKHANGEL'SK MILLS (SNIZHENIE ZAGRYAZNENNOSTI STOCHNYKH VOD NA ARKHANGEL'-SKOM KOMBINATE),
Arkhangelsk Kombinat (USSR).
For primary bibliographic entry see Field 5D.
W75-10368

INSTRUCTION FOR RECORD KEEPING OF WATER CONSUMPTION AT THE ENTERPRISES OF THE PAPER INDUSTRY (INSTRUKTSIYA UCHETA RASKHODA VODY NA PREDPRIYATIYAKH OTRASLI),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Vodosnabzheniya, Kanalizatsii, Gidrotekhnicheskikh Sooruzhenii i Inzhenernoi, Gidrogeologii, Moscow (USSR).
G. E. Gal'per, Ya. V. Nikitin, and A. F. Shabalin.
Bumazhnaya Promyshlennost, No 3, p 24-25, March, 1975. 3 fig.

Descriptors: *Water consumption, *Pulp and paper industry, *Logging(Recording), Recycling, Industrial water, Sulfite liquors, Pulp wastes, Recirculated water, Reclaimed water, Water reuse, Suspended solids, Dissolved solids, Waste water, Effluents, Water pollution sources, Water pollution control, Water quality control.
Identifiers: White water, Soviet Union(U.S.S.R.).

The All-Union Scientific and Technical Association of the Pulp and Paper Industry has developed a system for recording water consumption at pulp and paper mills. The system standardizes record keeping, explains how to calculate the overall consumption, and describes methods to be used for the determination of water consumption. The chapter devoted to the terminology to be used is discussed in this article. Recycled water is defined as water containing suspended and/or dissolved substances which is returned to the production line without any treatment (e.g., white water, or weak sulfite and kraft spent liquors used in pulp washing). Reused water is water containing suspended and/or dissolved substances which underwent treatment (cooling, purification, or both). Water successively used is water which has been used in one process, then used without any treatment in another process (or processes). Waste water (effluent) is water discharged into a river or another natural water reservoir after purification or without purification. Reused waste water is effluent which underwent purification in special equipment and is returned to the production line. (Stapinski-IPC)
W75-10370

WASTE WATER TREATMENT: WATER RECLAMATION AND REUSE,
National Environmental Research C ater, Cincinnati, Ohio. Advanced Waste Treatr ent Research Lab.
For primary bibliographic entry see Field 5D.
W75-10372

TAIO PAPER (COMPANY, IYOMISHIMA, JAPAN) EXPANDS TO 1,000,000 TONS/YEAR,
For primary bibliographic entry see Field 5D.
W75-10380

USE OF ORGANIC FLOCCULANTS FOR TEXTILE PLANT WATER TREATMENT (POUZITI ORGANICKYCH FLOKULANTU K CIRENI VODY PRO TECHNOLOGII TEXTILNI VYROBY),
For primary bibliographic entry see Field 5F.
W75-10383

INDUSTRIAL WASTES: PAPER AND ALLIED PRODUCTS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5D.
W75-10397

WATER REUSE IN A PAPER REPROCESSING PLANT,
Oklahoma Univ., Norman. School of Civil Engineering and Environmental Science.
For primary bibliographic entry see Field 5D.
W75-10401

WATER-QUALITY REQUIREMENTS FOR THE PETROLEUM INDUSTRY,
Neptune MicroFloc, Inc., Corvallis, Oreg.
For primary bibliographic entry see Field 5D.
W75-10465

INTERNATIONAL EXPLORATION LOCATES MINERALS AND OILS,
National Science Foundation, Washington, D.C. Office for the International Decade of Ocean Exploration.
For primary bibliographic entry see Field 5B.
W75-10467

WATER FOR INDUSTRIAL DEVELOPMENT IN ALCORN, ITAWAMBA, PRENTISS, AND TISHOMINGO COUNTIES, MISSISSIPPI,
Geological Survey, Jackson, Miss.
B. E. Wasson, and E. J. Tharpe.
Mississippi Research and Development Center, Jackson, 1975. 60 p, 31 fig, 10 tab, 38 ref.

Descriptors: *Water resources development, *Industrial water, *Mississippi, Groundwater resources, Surface waters, Water yield, Water quality, Data collections, Aquifer characteristics, Streamflow, Chemical analysis, Water demand.
Identifiers: Alcorn County, Itawamba County, Prentiss County, Tishomingo County.

Groundwater presently supplies all public and industrial water demands in Alcorn, Prentiss, Itawamba, and Tishomingo Counties, Mississippi. Pumpage in 1974 from public supply and industrial wells was about 8 million gallons per day. The principal water-bearing units are the upper 100 feet of the Paleozoic rocks, and the overlying Gordo Formation, Eutaw Formation, Coffee Sand, and Ripley Formation of Late Cretaceous age. Streams in the four-county area represent large potential water supplies. The Tennessee River, which bounds the northeast corner of the area, has a normal flow of about 13,000 mgd. The quality of water in the area is generally good, the dissolved-solids concentration in most of the water is less than 200 mg per litre and rarely more than 500 mg per litre. The pH of surface water is usually near neutral; the pH of groundwater ranges from 5 to more than 8, the deeper water having the higher pH. (Woodard-USGS)
W75-10581

THE LAWS AND THEIR ENFORCEMENT; PROGRESS AMIDST PROBLEMS,
For primary bibliographic entry see Field 5G.
W75-10607

METHOD OF TREATING ALUMINUM-CONTAINING WASTE WATER,
Kurita Water Industries Ltd., Osaka (Japan). (assignee)
For primary bibliographic entry see Field 5D.
W75-10730

AIR AND WATER POLLUTION CONTROL,
El Paso Southern Co., Tex. (assignee)
For primary bibliographic entry see Field 5D.
W75-10732

CLOSED RECYCLING SYSTEM FOR WATER PURIFICATION AND WASTE REDUCTION,
For primary bibliographic entry see Field 5D.
W75-10735

PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON WASTE OIL RECOVERY AND REUSE.
Association of Petroleum Re-Refiners, Washington, D.C.
For primary bibliographic entry see Field 5D.
W75-10739

AN ECONOMIC MODEL OF WASTE OIL RECOVERY, REPROCESSING AND DISTRIBUTION SYSTEMS,
Environmental Quality Systems, Inc., Rockville, Md.
For primary bibliographic entry see Field 5D.
W75-10768

ECONOMIC IMPACT OF THE CONVERSION OF WATER FROM IRRIGATION TO MUNICIPAL AND INDUSTRIAL USE IN THE RIO GRANDE BASIN OF NEW MEXICO,
New Mexico State Engineer, Santa Fe.
For primary bibliographic entry see Field 6D.
W75-10771

3F. Conservation In Agriculture

PHOSPHORUS AVAILABILITY OF SOME PHILIPPINE RICE SOILS AS AFFECTED BY SOIL AND WATER MANAGEMENT PRACTICES,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
P. A. Sanchez, and A. M. Briones.
Agron Journal, Vol 65, No 2, p 226-228, 1973.

Descriptors: Water management(Applied), *Phosphorus, *Flooding, Oxidation, Nutrients, Absorption, *Rice, Soils, *Soil management.
Identifiers: *Philippine Islands.

Two greenhouse experiments were conducted on 6 representatives Philippine lowland rice soils. The beneficial effects of flooding to rice vary with the level of available soil P, as measured by P uptake. In soils of high P availability, no differences were observed when rice was grown under constant flooding, on partially oxidized profile or when flooding was delayed 15-35 days after seeding. The latter 2 treatments produced lower yields and P uptake in comparison to constant flooding in soils of moderate to low P availability. When severe water stress occurred, rice growth, yield and P uptake drastically decreased in all soils regardless of P availability. Puddling flooded soils had no effect on rice yields or P uptake at harvest regardless of soil P availability. Puddling unflooded soils severely decreased growth and responses to applied P when severe soil shrinkage took place. The benefits of flooding on P uptake by rice depend both on the available P level and the type of water management used.--Copyright 1973, Biological Abstracts, Inc.
W75-10421

EFFECT OF A PHYTOPLANKTON CULTURE ON THE GERMINATION AND SEEDLING DEVELOPMENT OF BARLEY, SUGAR BEETS AND LETTUCE,
American Bioculture, Inc., Phoenix, Ariz. Research Lab.
C. H. Davis, and E. R. Bigler.
Agron Journal, Vol 65, No 3, p 462-464, 1973. Illus.

Descriptors: *Planting management, Phytoplankton, *Germination, Plant growth, *Barley, *Sugar beets, *Lettuce, *Chlorophyta, Seeds.

The effect of various quantities of a Chlorophyta phytoplankton culture on seed germination, seedling development, and yield was evaluated in both the laboratory and field. In the laboratory, 'Arivat' barley (Hordeum vulgare L.) seedlings were grown in aqueous solutions of phytoplankton culture. Shoot length was increased by 100 and 1000 ppm concentrations of the culture but was unchanged at 10000 and 100000 ppm. There was an inverse relationship between shoot length and shoot weight per unit length. In the field, barley seedling emergence was significantly increased by injecting diluted phytoplankton culture with the seed at a rate of 3 1/240 m of row. Preplant irrigation with a 1000 ppm dilution of phytoplankton culture in the field increased sugar beet (Beta vulgaris L.) and lettuce (Lactuca sativa L.) seedling emergence. Subsequent post-plant applications of the phytoplankton resulted in additional increase in seedling emergence. Increased production was found for the sugar beets at all levels of treatment. This further increase could not be allocated to either growth regulator or soil modification but could be the result of both acting at once.--Copyright 1973, Biological Abstracts, Inc.
W75-10496

SOME EFFECTS OF FIELD WEATHERING OF SEED COTTON IN A DESERT ENVIRONMENT,
Arizona Univ., Tucson. Dept. of Agronomy and Plant Genetics.
D. R. Buxton, H. N. Stapleton, Yahia Makki, and R. E. Briggs.
Agron Journal, Vol 65, No 1, p 14-17, 1973, Illus.

Descriptors: *Weathering, *Cotton, Seeds, Deserts, Environment, *Southwest US, Crop production, Harvesting.

In field studies in southwestern USA, cotton (Gossypium hirsutum L.) was machine picked about every 10 days to investigate the effect of weathering. Each harvest was from cotton not previously harvested. Other plots were harvested repeatedly by hand to determine the contribution of late-open bolls to changes in seed cotton properties. In a greenhouse study open bolls were weathered for 10 wk and sampled weekly. The bolls were moistened with 0.5 ml water/boll either weekly or twice weekly and compared with an unwatered check to investigate the effect of wetting and drying cycles that occur in the field from rain and dew formation. Weathering did not result in loss of dry weight of lint or seed. Upper-half-mean-fiber-length was significantly reduced by the 10-wk greenhouse weathering period, but fiber fineness and strength were not affected. Weathering in the field resulted in average reductions of 0.8, 0.8, and 1.0%/wk for upper-half-mean-length, strength, and fineness, respectively, during Oct. and Nov. Harvesting late in the fall will not reduce yield if cotton does not drop to the ground, but a reduction in fiber quality can be expected.--Copyright 1973, Biological Abstracts, Inc.
W75-10557

HYDROLOGY OF THE ALBEMARLE-PAMLICO REGION, NORTH CAROLINA--A PRELIMINARY REPORT ON THE IMPACT OF AGRICULTURAL DEVELOPMENTS,
Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 4C.
W75-10602

WATER RESOURCES OF THE TOPPENISH CREEK BASIN, YAKIMA INDIAN RESERVATION, WASHINGTON.
Geological Survey, Tacoma, Wash.
Available from NTIS, Springfield, Va 22161 as PB-243 749, $7.50 printed copy, $2.25 in microfiche. Water-Resources Investigations 42-74, January 1975. 144 p, 32 fig, 5 tab, 31 ref, 4 append.

Descriptors: *Water resources, *Indian reservations, *Washington, *Hydrologic data, Surface waters, Groundwater resources, Irrigation, Water resources development, Water wells, Well data, Aquifer characteristics, Water yield, Water levels, Water utilization, Hydrogeology, Streamflow, Hydrology, Surface-groundwater relationships.
Identifiers: *Yakima Indian Reservation(Wash), Toppenish Creek basin(Wash).

About 94 percent, or 655,000 acre-feet per year, of water used for irrigation in the Toppenish Creek basin of the Yakima Indian Reservation Wash., is diverted from the Yakima River, the eastern boundary of the reservation. The flows of Toppenish Creek and its tributaries are small in comparison, but they are vital to irrigation of areas upslope from the irrigation canals. About 17.5 acre-feet per year of groundwater from a basalt aquifer and about 3.5 acre-feet per year from young and old valley-fill aquifers also are used for irrigation in the basin. Each aquifer is capable of yielding more than 1000 gallons per minute to efficiently constructed wells. Owing to seepage from canals and irrigated lands, the groundwater level in the young valley fill aquifer is higher at present (1974) than in the past, but some water-level declines have occurred in the old valley fill and basalt aquifers. Water levels in wells tapping the basalt aquifer have been lowered in some places as much as 80 feet during the past 15 years. The young valley fill aquifer in the eastern part of the basin is the best source of groundwater. (Woodard-USGS)
W75-10603

RECLAMATION OF TEXTILE PRINTING WASTEWATERS FOR DIRECT RECYCLE,
Clemson Univ., S.C. Dept. of Environmental Systems Engineering.
For primary bibliographic entry see Field 5D.
W75-10676

RESPONSES OF 'BEARSS' LEMON TO NITROGEN, POTASSIUM AND IRRIGATION APPLICATIONS,
Agricultural Research and Educational Center, Lake Alfred, Fla.
R. C. J. Koo, T. W. Young, R. L. Reese, and J. W. Kesterson.
Proc Fla State Hortic Soc, 86 p 9-12, 1973(1974).

Descriptors: *Lemon, *Nitrogen, *Potassium, Irrigation programs, *Fertilizers, Fertilization, Fruit crops, Irrigation practices, *Crop production.
Identifiers: *Bearss lemon.

Results of a 4-yr study of young bearing 'Bearss' lemon on sour orang rootstock under 3 levels each of N and K fertilization and 2 levels of irrigation treatments are reported. Increased N application resulted in an increase in fruit production, peel oil content, scab infection and green fruit after curing. The latter 2 factors accounted for lower fresh fruit pack. Potash application increased the acid content of fruit. High soil moisture content maintained through irrigation resulted in increased fruit production, peel oil, scab infection, fruit size, and hastened fruit maturity. Different fertilizer and irrigation programs are suggested for fresh and processing lemons.--Copyright 1974, Biological Abstracts, Inc.
W75-10714

RELATIONSHIPS BETWEEN DROUTH AND CORN YIELDS ON SELECTED SOUTH ATLANTIC COASTAL PLAIN SOILS,
North Carolina State Univ., Raleigh.
C. D. Sopher, R. J. McCracken, and D. D. Mason.
Agronomy Journal, Vol 65, No 3, p 351-35[illegible] 1973. Illus.

Descriptors: *Corn(Field), Crop production, *Drought tolerance, *Coastal plains, *North Carolina, Soil-water-plant relationships, *Drought resistance.
Identifiers: Drought index.

The effects of drouth-days by physiological growth period on corn (Zea mays L.) grain yields was determined, and a 1-figure drouth index suitable for expressing these effects was developed. A drought-day was defined as a 24-hr period when potential evapotranspiration exceeds rainfall plus the effective moisture storage capacity. The physiological growth periods were: 2-equal-length periods prior to tasseling; tasseling; and a maturity period. The study was conducted on 2 major North Carolina Soil Groups. On the better drained (Udultic) soils of the Upper and Middle Coastal Plains, drough-days accounted for 62.6% of the corn yield variation. The effects of drouth were detrimental in the 2nd and 4th growth periods, and grain yields were reduced to zero after 5 drouth-days during the tasseling period. For the very poorly drained (Aquatic) soils of the Tidewater Region, drouth-days accounted for 41.2% of the yield variation. Detrimental drought-day effects were only present during the 2nd and tasseling periods. The reduction of the effects of drouth-days on these soils was attributed to moisture extrction from an underlying water table. Using the derived regression coefficients for weights, the drough-days by physiological growth periods were weighted and summed to develop a 1-figure drough-index This index may be used as a single climatic variable in regression-correlation studies of the crop-soil ecological system.--Copyright 193, Biological Abstracts, Inc.
W75-10721

AGRICULTURAL AND URBAN CONSIDERATIONS IN IRRIGATION AND DRAINAGE.
American Society of Civil Engineers, New York.
For primary bibliographic entry see Field 4A.
W75-10769

WEATHER MODIFICATION FOR USE IN THE HIGH PLAINS,
South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
For primary bibliographic entry see Field 3B.
W75-10775

GROUNDWATER CONTROL BY PUMPING,
Central Nebraska Public Power and Irrigation District, Holdrege.
For primary bibliographic entry see Field 4B.
W75-10778

GROUNDWATER MODEL AS A TOOL IN PLANNING AND MANAGEMENT,
CH2M/Hill, Portland, Oreg.
For primary bibliographic entry see Field 4B.
W75-10781

DEVELOPMENT OF LARGE SCALE DRIP IRRIGATION SYSTEMS,
Superior Farming Co., Bakersfield, Calif.
B. R. Olson, Jr.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 311-316, 1974.

Descriptors: *Irrigation systems, *Evaluation, *Irrigation engineering, *California, Irrigation, Economics, Irrigation practices, Irrigation operation and maintenance, Irrigation design, Automation, Experimental farms, Agriculture, Argicultural engineering, Testing.
Identifiers: *Drip irrigation, Test plots.

Superior Farming Company owns and operates 37,000 acres (15,000 hectares) in the western United States from Tucson, Arizona, to Madera, California. Over 34,000 acres (13,800 hectares) are in operation near Bakersfield, California. Water and labor costs are fairly expensive and increasing rapidly. There were just two of the factors involved in the analysis of the benefits of drip irrigation. During the summer of 1970, Superior Farming Company embarked on an ambitious program of drip irrigated test plots on a variety of crops. The tests were conducted on tomatoes, almonds, citrus, grapes, plums, and apples. The plots included a variety of soil types, from a clay to sand, in different areas throughout California. The system was designed with the aid of a computer which minimized; for each joint of pipe, the annual depreciated pipe cost plus power costs for the underground hydraulic system. More practical, economical research is required concerning proper filtration for drip systems. Hopefully, new and better emitters will be designed within the next few years. The producing, commercial grower must always weight the economics of any irrigation system. Superior Farming Company feels that drip irrigation has a good economic outlook in some areas. (See also W75-10769) (Sims-ISWS)
W75-10784

WATER USE AND PRODUCTION OF TRICKLE IRRIGATED ONIONS,
New Mexico State Univ., University Park. Dept. of Agricultural Engineering.
T. C. Patterson.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 317-328, 1974. 4 fig, 2 tab, 8 ref.

Descriptors: *Irrigation, *Irrigation practices, *Irrigation efficiency, *New Mexico, *Onions, Crop response, Irrigation systems, Furrow irrigation, Sprinkler irrigation, Salinity, Agriculture, Crops.
Identifiers: *Trickle irrigation.

In acreage and value of production, dry onions are one of New Mexico's most important vegetables. The purpose of this study was to determine the extent to which sprinkler and trickle irrigation systems can be used to optimize water-use efficiency of onions by maintaining high water-application efficiency and continuous high levels of readily available moisture in the soil. The control was furrow irrigation applied according to local practice. This study also monitored the salinity levels under the various treatments. It was found that the use of trickle and sprinkler irrigation systems capable of efficiently applying light, frequent applications of irrigation water can significantly increase the water-use efficiency of onions. Total yield of onions can normally be significantly increased by maintaining higher soil moisture levels throughout the growing season. Irrigation systems operated at extremely high efficiencies result in considerable water savings, but without a leaching fraction added to depths of application, a rapid salt build up occurs. (See also W75-10769) (Sims-ISWS)
W75-10785

FLOAT VALVE PROVIDES VARIABLE FLOW RATES AT LOW PRESSURES,
California Polytechnic State Univ., San Luis Obispo. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 8C.
W75-10789

EFFECTS OF SOIL MOISTURE ON STRESS ON 2 VARIETIES OF UPLAND COTTON IN ISRAEL: IV. EFFECTS OF PERIODS OF STRESS OCCURRENCE, CORRELATIONS AND REGRESSIONS,
Hebrew Univ., Rehovoth (Israel). Faculty of Agriculture.
A. Marani.
Exp Agric. Vol 9, No 2, p 121-128, 1973, Illus.

Descriptors: *Soil moisture, *Cotton(Field), *Moisture stress, Regression analysis, Correlation analysis, Irrigation, Plant physiology, Seeds, Crop production.
Identifiers: *Israel.

Effects of moisture stress during different stages of cotton development were evaluated by using correlation and regression methods on data of 6 irrigation experiments from 3 different climatic regions. Significant negative correlations were found between the number of days in which soil moisture was below a threshold level and several plant traits. Flower number was usually affected adversely by stress at the beginning of flowering; boll number, boll retention, boll weight, lint yield, lint length and seed index by stress at the end of flowering; earliness and lint fineness by stress during early boll development. Lint index, percent and strength were affected by stress at different periods and effects of stress on lint yield were correlated with its effects on boll number, boll weight, lint length and early maturity. (See also W72-08772, W72-05180, and W72-05179)--Copyright 1973, Biological Abstracts, Inc.
W75-10791

PROTEIN CONTENT OF WINTER WHEAT GRAIN AS RELATED TO SOIL AND CLIMATIC FACTORS IN THE SEMI-ARID CENTRAL GREAT PLAINS,
D. E. Smika, and B. W. Greb.
Agronomy Journal, Vol 65, No 3, p 433-436, 1973, Illus.

Descriptors: *Protein, *Wheat, *Great Plains, Arid lands, Nebraska, Colorado, Regression analysis, *Soil water, Soil profiles, *Climates, Nitrates, Nitrogen, Air temperature.

Protein content of wheat (Triticum aestivum L.) grain has decreased in recent years in the Central Great Plains. Protein content data from North Platte, Nebraska; Akron, Colorado; and several southwestern Nebraska locations were shown to be negatively correlated by linear regression with total precipitation > 1.25 cm for a 15-day period 40-55 days before maturity (r = -0.70**) or with available soil water at seeding so a depth of 1.2 or 1.8 m (r = -0.79**). Grain protein levels were shown to be positively correlated by linear regression with total soil NO3-N to depths of 1.2- or 1.8-m (r = 0.82**) and by curvilinear regression with maximum air temperature for a 5-day period 15-20 days before maturity (r = 0.74**). With all 4 factors combined, r sup 2 = 0.96. With available soil water to seeding plus NO3-N in the soil profile at seeding and protein content of wheat grain, r sup 2 = 0.86. Maximum yield was obtained with 28 cm of soil water available at seeding, and at least 106 kg/ha of NO3-N at seeding was needed to obtain grain with 12% protein.--Copyright 1973, Biological Abstracts, Inc.
W75-10792

EVALUATION OF AGRICULTURAL DRAINAGE IN WATER QUALITY MANAGEMENT,
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 5G.
W75-10796

EFFECTIVENESS OF PRECIPITATION IN A MOUNTAIN MEADOW,
Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 2D.
W75-10799

IRRIGATION MANAGEMENT FOR SALT CONTROL,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
For primary bibliographic entry see Field 3C.
W75-10800

TRICKLE IRRIGATION DESIGN REQUIREMENTS FOR ROW CROPS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
D. A. Bucks.
In: Agricultural and Urban Considerations In Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 673-689, 1974. 1 fig, 3 tab, 13 ref, 2 append.

Descriptors: *Irrigation, *Irrigation systems, *Irrigation efficiency, *Crops, Field crops, Cotton(Field), Furrow irrigation, On-site investigations, Consumptive use, Leaching, Salts, Irrigation practices, Agriculture.
Identifiers: *Trickle irrigation, Row crops, Cabbage.

A properly-managed trickle irrigation system should provide a soil environment where the minimum possible water application will permit the germination of seeds, emergence of seedlings, and the development of an adequate root system. Basic principles of plant water needs are essentially the same for trickle irrigation as for other irrigation methods. Soil moisture must be maintained in a range that permits adsorption of water by plant roots at a rate comparable to transpiration losses, and the soluble salt content in the root zone must not limit plant growth and water absorption. Field research on the management of trickle irrigation systems was conducted on cotton and cabbage. Quantity and frequency of trickle irrigation for possible increased yield and decreased irrigation water requirement were evaluated and compared to standard-furrow irrigation practices. Seasonal and peak consumptive-use requirements, when using trickle irrigation for cotton and cabbage production, appeared to be the same as for furrow irrigation. The capability of varying frequency of trickle irrigation, depending on the soil and crop, would provide flexibility in the operation of a trickle irrigation system. An overall irrigation efficiency as high as 90% seems possible for the trickle irrigation of row crops with presently available trickle irrigation systems. (See also W75-10769) (Sims-ISWS)
W75-10801

FIVE YEAR STUDY OF DES MOINES RIVER WATER QUALITY,
Iowa State Univ., Ames. Engineering Research Inst.
For primary bibliographic entry see Field 5B.
W75-10803

FLOODING AND SOIL TEMPERATURE EFFECTS ON WHEAT DURING GRAIN FILLING,
Oak Ridge National Lab., Tenn.
R. J. Luxmoore, R. A. Fischer, and L. H. Stolzy.
Agronomy Journal, Vol 65, No 3, p 361-364, 1973.

Descriptors: *Flooding, *Soil temperature, *Wheat, *Root systems, *Crop production, Respiration.
Identifiers: Root respiration, Grain filling.

The root environment of wheat (Triticum aestivum L. em Thell) was modified with flooding and soil temperature treatments during the grain filling stage in an assessment of the relation between root respiration and grain yield. Short term flooding (10-15 days) at 15-17 C soil temperature in a pot and field experiment did not influence yield. Longer term flooding (20-30 days) reduced yield by 15-23% at 15-17 C soil temperature and by 73% at 25 C soil temperature. Yield reduction was associated with smaller mean grain weight. At 5C soil temperature 30 days of flooding had no significant effect on yield. Stem dry weight per tiller decreased by about 25% with increase in soil temperature from 5 to 25 C for both flooded and non-flooded treatments. Mathematical simulation estimates of root respiration applied to the experimental conditions indicated that roots were a minor sink for assimilate during the grain filling stage. Root environmental effects on wheat yield could not be interpreted in terms of roots being competitive with the developing grain for photosynthate. The significant effects of soil conditions on the maturing wheat plant indicate some importance of roots and root environment during the grain filling stage.--Copyright 1973, Biological Abstracts, Inc.
W75-10829

ACTMO, AN AGRICULTURAL CHEMICAL TRANSPORT MODEL,
Agricultural Research Service, Chickasha, Okla.
For primary bibliographic entry see Field 5B.
W75-10846

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

ANALYZING REIMBURSEMENT MECHANISMS FOR RESOURCE DEVELOPMENT PROJECTS,
Wyoming Univ., Laramie. Div. of Agricultural Economics.
For primary bibliographic entry see Field 6C.
W75-10353

LAND USE SIMULATION MODEL OF THE SUBALPINE CONIFEROUS FOREST ZONE,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 3B.
W75-10404

WATERSHED MANAGEMENT IN THE ROCKY MOUNTAIN SUBALPINE ZONE: THE STATUS OF OUR KNOWLEDGE,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 3B.
W75-10405

THE LOWER COLORADO RIVER: A BIBLIOGRAPHY,
Arizona Western Coll., Yuma.
For primary bibliographic entry see Field 10C.
W75-10453

PROCEEDINGS SYMPOSIUM ON STATISTICAL HYDROLOGY.
Agricultural Research Service, Washington, D.C.
For primary bibliographic entry see Field 2A.
W75-10507

SOME PROBLEMS IN PURE AND APPLIED STOCHASTIC HYDROLOGY,
Toronto Univ. (Ontario). Dept. of Mechanical Engineering; and Toronto Univ. (Ontario). Inst. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 2A.
W75-10508

STATISTICAL TOLERANCE LIMITS FOR A PEARSON TYPE III DISTRIBUTION,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-10511

A MODEL OF STATISTICAL ERRORS IN ESTIMATING STREAMFLOW FROM CONTINUOUS-STAGE RECORDS,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 2E.
W75-10512

USE OF AUTOREGRESSIVE RUNOFF MODELS IN RESERVOIR STUDIES,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-10523

STATISTICAL INFERENCE ON STREAMFLOW PROCESSES WITH MARKOVIAN CHARACTERISTICS,
Arizona Univ., Tucson. Dept. of Mathematics.
For primary bibliographic entry see Field 2E.
W75-10525

RECURRENCE INTERVALS OF ANNUAL MINIMUM STREAMFLOWS,
Keystone Junior Coll., LaPlume, Pa. Dept. of Mathematics.
For primary bibliographic entry see Field 2E.
W75-10530

NONLINEAR CHANNEL ROUTING BY COMPUTER,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
M. C. Quick, and A. Pipes.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 101, No HY6, Proceedings Paper 11353, p 651-664, June 1975. 11 fig, 9 ref, 2 append.

Descriptors: *Channel flow, *Stage-discharge relations, *Canada, *Routing, *Hydraulic design, *Model studies, River forecasting, Digital computers, Flow, Storage, Channels, Design, Hydraulics, Hydrology, Simulation analysis.
Identifiers: *Fraser River(British Columbia), Wedge storage.

A simple but accurate nonlinear river channel routing method was developed which can be calibrated from standard water survey measurements of stage-discharge and stage-velocity. The flow model was based on well-established kinematic flood wave behavior. The routing coefficients were not derived from analysis of the inflows and outflows to a given reach, but were derived directly from the stream gaging data for each reach, i.e., the stage-discharge and the stage-velocity curves. The routing procedures are computationally simple and are described by equations. Because the procedure computes according to wave travel time, the storage term is purely wedge storage and this led to part of the simplification. Because the procedure operates on changes in flow, an extremely simple reservoir routing-method was derived. The model was designed for computation by digital computer, although hand computation is feasible for simple systems. (Lardner-ISWS)
W75-10543

INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES.
National Oceanic and Atmospheric Administration, Rockville, Md.
For primary bibliographic entry see Field 2H.
W75-10550

FLOOD PLAIN INFORMATION: OUACHITA RIVER, HOT SPRINGS CREEK, STOKES CREEK, MOLLY CREEK, GULPHA CREEK, CITY OF HOT SPRINGS, ARKANSAS.
Army Engineer District, Vicksburg, Miss.

Prepared for the City of Hot Springs, Arkansas, June, 1974. 29 p, 15 fig, 24 plates, 7 tab.

Descriptors: *Floods, *Flooding, *Flood plains, *Flood profiles, *Flood forecasting, Flood data, Flood damage, Maximum probable flood, Historic floods, *Arkansas.
Identifiers: Hot Springs(Arkansas), *Ouachita River(Ark), Garland County(Ark), Hot Springs Creek(Ark), Stokes Creek(Ark), Molly Creek(Ark), Gulpha Creek(Ark), Intermediate Regional Flood(IRF), Standard Project Flood(SPF).

The Ouachita River, which rises at Rich Mountain in the Ouachita Mountains west of Mena, Arkansas, and its tributary creeks, with drainage basins of rugged and steep terrain, flow through the Hot Springs, Arkansas area encompassing all types of urban, rural, and recreational land uses. Additional development is expected for the various floodplains as pressure for expansion increases. Carpenter Dam, owned and operated by Arkansas Power and Light Company since 1932, forms Lake Hamilton about 1 mile downstream from the junction of Hot Springs Creek and the Ouachita River. Gates at Carpenter Dam are also operated for maximum flood control. Blakely Mountain Dam, which forms Lake Ouachita, was constructed in 1944 on the Ouachita River about 10 miles above Hot Springs by the Army Corps of Engineers as part of a flood control program. Its flood gates are being operated to keep flooding at a minimum. Floods occur during all seasons. Much of the rainfall occurs in April and May with an average annual rainfall of 54 inches. The greatest flood of record occurred in May, 1923 when Hot Springs Creek had an elevation of 643.4 feet at mile 4.47 and extensive damage was caused by rushing flood waters on the city's main street. The elevation of the projected Intermediate Regional Flood (IRF) would be 646.3 feet and of the Standard Project Flood (SPF) would be 647.3 feet at mile 4.37. Peak discharge at the mouth of Hot Springs Creek would be 12,600 cfs for an IRF and 19,600 cfs for an SPF. Future damage could be extensive due to the high waters, high velocities and rapid rise of flood waters. (Park-North Carolina)
W75-10559

FLOOD PLAIN INFORMATION: BUSHKILL CREEK, VICINITY OF EASTON, PENNSYLVANIA.
Army Engineer District, Philadelphia, Pa.
Prepared for the Lehigh-Northampton County Joint Planning Commission, January, 1972. 26 p, 10 fig, 15 plates, 8 tab.

Descriptors: *Flood forecasting, *Flood plains, *Flood damage, Flood data, Flood profiles, Flood stages, Obstruction to flow, Land use, Planning, Historic floods, *Pennsylvania, Flash floods, Delaware River.
Identifiers: *Bushkill Creek(Pa), Easton(Pa), Flood plain management, Intermediate Regional Flood(IRF), Standard Project Flood(SPF).

Aside from the City of Easton, Pennsylvania, located at the confluence of Bushkill Creek and the Delaware River, the flood plain of Bushkill Creek is mostly undeveloped. The upper and middle reach are characterized by low banks with gently sloping flood plains, the lower reach by steep banks, man-made fills, and retaining walls. Spring floods are caused by snowmelt runoff and heavy rains; fall floods by general rainfall runoff. Flash floods produced by local thunderstorms occur year-round. The most severe flood recorded, caused by a thunderstorm, occurred July 9, 1945 and had a magnitude between an Intermediate Regional Flood (IRF) and a Standard Project Flood (SPF). Based on gage information, an IRF would have a water surface elevation of 204.6 ft. m.s.l.d. and a peak discharge of 10,000 cfs at the creek's mouth; and SPF's elevation would be 207.2 ft. and peak discharge would be 24,500 cfs. In several locations, the water surface elevation of the July 1945 flash flood was greater than an IRF or SPF due to structures which were clogged with debris. There are 9 dams, 45 bridges, and 2 buildings that cross the creek and can create obstructions. (Diefendorf-North Carolina)
W75-10560

FLOOD PLAIN INFORMATION: BLOOMSBURG, COLUMBIA COUNTY, PENNSYLVANIA-SUSQUEHANNA RIVER.
Army Engineer District, Baltimore, Md.
Prepared for the Columbia County Planning Commission, Bloomsburg, Pennsylvania, February, 1974. 36 p, 3 fig, 13 plates, 8 tab.

Descriptors: *Flood plains, *Flood data, *Floods, *Flood profiles, Flood forecasting, Flood recurrence interval, Flood stages, Flood proofing, Nonstructural alternatives, Maximum probable flood, Regional flood, Flow duration, Historic flood, *Pennsylvania.
Identifiers: Bloomsburg(Pa), Columbia Co(Pa), *Susquehanna River(Pa), Fishing Creek(Pa), Catawissa Creek(Pa), Standard Project Flood, Intermediate Regional Flood.

Portions of Columbia County, Pennsylvania, were flooded extensively in 1936 and 1972 by waters from the Susquehanna River, Fishing Creek, and Catawissa Creek; studies indicate larger floods are possible. Unfortunately, there is continuous pressure to develop the flood plain due to the area's increasing population. Major floods on the Susquehanna River can occur during any season, but most have occurred in the spring. Although a combination of heavy rain and snowmelt caused past flooding, the largest flood of record resulted from Tropical Storm Agnes in June 1972 when heavy rains fell on previously saturated ground. As much as 16 inches fell in some areas of the Susquehanna basin with record runoffs. Flooding here causes moderately rapid rises in the river stage, is of long duration, and has a high flow velocity. During the June 1972 flood, the river rose one foot per hour and remained out of banks for 3 1/2 days, and water velocity was as high as 9 miles/hour. The river is crossed by two highway bridges and one railroad bridge, but the underclearances are above the Intermediate Regional Flood level, offering little flow obstruction. There are no flood control projects authorized, and while six upstream reservoirs lower the frequency of flooding, they do not provide complete protection. An Intermediate Regional Flood would rise 7 ft over 54 hours and stay above bankfull 96 hours; a Standard Project Flood would rise 35 feet in 96 hours and be above bankfull 148 hours. (Grden-North Carolina)
W75-10561

FLOOD PLAIN INFORMATION: BRANDYWINE CREEK, CHESTER COUNTY, PENNSYLVANIA.
Army Engineer District, Philadelphia, Pa.
Prepared for the Chester County Planning Commission, March, 1972. 24 p, 8 fig, 13 plates, 8 tab.

Descriptors: *Flood forecasting, *Flood plains, *Flood damage, Flood profiles, Historic floods, Flood stages, Obstruction to flow, Land use, Planning, *Pennsylvania.
Identifiers: *Brandywine Creek(Pa), Chester County(Pa), Chadds Ford(Pa), Lenape(Pa), Soil Conservation Service, Water Resources Authority, Flood plain management, Standard Project Flood, Intermediate Regional Flood.

This is the third of 4 reports on Brandywine Creek flooding. It covers 9.8 miles of the Main Stem beginning near the Pennsylvania-Delaware border continuing upstream to the confluence of East and West Branches near Lenape, Pennsylvania. The relatively broad flat flood plain, bordered by gently rolling hills, is rural and largely undeveloped. Floods generally occur in the summer and fall when rain is greatest. Obstruction to flow is created by 6 bridges and 3 dams which are the low-flow type with no significant storage or flood control capacity. Information on historic floods at the Chadds Ford, Pa., gage gives largest flood records of 17,200 cfs in 1920 and 16,800 cfs in 1942. At this gage, an Intermediate Regional Flood (IRF) would have a discharge of 24,000 cfs and a Standard Project Flood (SPF) of 63,100 cfs. Both would inundate residential, commercial, and industrial properties, creating hazardous situations. The Soil Conservation Service has proposed construction of 10 dams to be located on East and West Branches which would reduce the IRF and SPF discharges to 18,700 cfs and 49,200 cfs respectively. The Water Resources Authority has developed a plan for the purchase of water resources protection rights in areas most critical to water resources. (Diefendorf-North Carolina)
W75-10562

FLOOD PLAIN INFORMATION: GOLDSMITH GULCH, DUTCH CREEK, LILLEY GULCH, AND COON CREEK, VOLUME VI, DENVER METROPOLITAN REGION, COLORADO.
Army Engineer District, Omaha, Nebr.
Prepared for Denver Regional Council of Governments and the Urban Drainage and Flood Control District, October, 1971. 50 p, 20 fig, 21 plates, 11 tab.

Descriptors: *Floods, *Flooding, *Flood forecasting, *Flood flow, *Flood peak, Flood water, Obstructions to flow, Tributaries, Maximum probable flood, *Colorado, Flood data, Flood plains.
Identifiers: Goldsmith Gulch(Col), Dutch Creek(Col), Lilley Gulch(Col), Coon Creek(Col), Denver(Col), Denver County(Col), Arapahoe County(Col), Intermediate Regional Flood, Standard Project Flood.

The four streams located at the southern edge of Denver, Colorado, flow through areas undergoing urbanization and are susceptible to the flash-floods typical of the region. Goldsmith Gulch, draining 7.80 sq mi in southeast Denver and adjacent Arapahoe Creek, has an average gradient of 19.6 ft/mi with a maximum of 26.9 ft/mi. 'The flood plain is narrow in the upper reaches and widens slightly as it merges with the Cherry Creek flood plain.' Average channel depth is 4.5 ft with average channel top width of 83 ft. Maximum channel top width is 200 ft. Planned subdivisions are the predominant development pattern. By 1980 this basin is expected to be about 92% developed. Dutch Creek and its major tributaries, Lilley Gulch and Coon Creek, have narrow flood plains which widen slowly in downstream direction. Most basin land is presently agricultural with some scattered urban development. Dutch Creek basin is anticipated to be about 36% developed by 1980. Past floods on the streams have been quick rising, of short duration, and caused by 'cloudburst' rainstorms. Based on data correlated for similar streams since discharge measurements are not available specifically for the streams of this report, potential floods, the Intermediate Regional Flood (IRF) and the Standard Project Flood (SPF) would have peak discharges of 3,500 cfs and 6,800 cfs respectively on Goldsmith Gulch above I-225 and 3,750 cfs and 16,600 cfs on Dutch Creek below the confluence with Coon Creek. Roads across the creeks would be in danger from the high waters and high velocities. Accompanying tables and plates give detailed data for points on the streams. (Park-North Carolina)
W75-10563

FLOOD PLAIN INFORMATION: MEADOW CREEK, ALBEMARLE COUNTY AND CHARLOTTESVILLE, VIRGINIA.
Army Engineer District, Norfolk, Va.
Prepared for Charlottesville and Albemarle County, Virginia, January, 1972. 49 p, 7 fig, 14 plates, 15 tab.

Descriptors: *Floods, *Flooding, *Water management(Applied), *Virginia, *Flood profiles, *Flood plains, Flood control, Flood protection.

Identifiers: *Meadow Creek(Va), Albemarle County(Va), Charlottesville(Va), Standard Project Flood, Intermediate Regional Flood, Rivanna River(Va).

Meadow Creek, a small stream whose flood plains vary from 75 to 700 feet, flows easterly for 6 miles passing in and out of Charlottesville, Virginia, several times before emptying into the Rivanna River. The outer edge of the flood plain is defined by abruptly rising topography which curtails flood waters. Development in the flood plain consists of only a few scattered structures. Obstructions to flood flow include bridges and culverts but backwater effects in a flood are relatively minor due to the stream's fairly steep slope. Minor to moderate flooding prevails in the spring, although larger floods may occur at any time resulting from heavy general rains or from intense rainfall from tropical storms. Duration of floods is short and the water rises rapidly to overbank stages. No flood damage prevention measures currently exist. In absence of data for Meadow Creek, information was collected from nearby streams. The greatest flood occurred in October 1942. At approximately 6,400 ft. above the mouth of Meadow Creek, an Intermediate Regional Flood (IRF) would have peak discharge of 5,900 cubic feet per second (cfs) with maximum channel velocity of 12 ft/sec and maximum overbank velocity of 5 ft/sec. A Standard Project Flood (SPF) at the same site would discharge 9,400 cfs with 14 ft/sec maximum velocity channel flow and 6 ft/sec maximum overbank velocity. 'The SPF profile for Meadow Creek would vary from 1 to 7 feet higher than the IRF in the study area.' (Salzman-North Carolina)
W75-10564

FLOOD PLAIN INFORMATION: MACON COUNTY, ILLINOIS.
Army Engineer District, Chicago, Ill.
Prepared for Macon County Regional Plan Commission, February, 1971. 107 p, 47 fig, 24 plates, 17 tab.

Descriptors: *Floods, *Flooding, *Flood frequency, *Flood profiles, *Flood protection, *Flood control, *Flood forecasting, Flow, *Flood plains, Obstructions to flow, Rivers, Tributaries, *Illinois, Flood damage.
Identifiers: Decatur(IL), *Sangamon River(Ill), Intermediate Regional Flood(IRF), Standard Project Flood(SPF), Stevens Creek(IL), Spring Creek(IL), Finley Creek(IL), Big Creek(IL), Long Creek(IL).

This report will aid Macon County, Illinois, and the City of Decatur in solving local flood problems on the Sangamon River and Stevens, Spring, Finley, Long and Big Creeks, a total of 54 miles of streams. The main flood season is winter and spring but flash floods are a year-round problem. Forty five floods have occurred from 1939 to 1968 at various seasons causing damage to the industrial, commercial and especially to the agricultural lands bordering the river and creeks. Most of the residential development is above the damage level but pressures exist for increasing residential development in the floodplain. Nearly all the bridges across the five creeks are serious obstructions to the Intermediate Regional Flood (IRF) and the Standard Project Flood (SPF). The major flood recorded was in May, 1943 with an elevation of 605.5 ft. at the Illinois Highway 48 bridge about a mile below Decatur Dam on the Sangamon River. The IRF would be 0.45 feet higher and the SPF would be 12.44 feet higher than the flood of 1943 at the same location. Lake Decatur, a long narrow water supply reservoir with average depth of less than 10 feet, is not effective in reducing flood heights. Flood hazard areas, river profiles, and significant data on the river and 5 creeks are presented for policy guidance. (Park-North Carolina)
W75-10565

FLOOD PLAIN INFORMATION: EAST FORK ONE HUNDRED AND TWO RIVER, BEDFORD, IOWA.
Army Engineer District, Kansas City, Mo.
January, 1969. 34 p, 11 fig, 10 plates, 6 tab.

Descriptors: *Flood data, *Flood velocity, *Flood, *Flooding, *Flood plains, *Flood control, Flood protection, Flood frequency, Flood forecasting, Flow, Obstructions to flow, Rivers, *Iowa, Flow characteristics, Historic floods.
Identifiers: *Bedford(Ia), *East Fork One Hundred and Two River(Ia), Intermediate Regional Flood(IRF), Standard Project Flood(SPF).

This report covers a 5-mile reach of the East Fork One Hundred and Two River as it flows through Taylor County, Iowa, in the vicinity of Bedford. Major floods occurred in January, 1960 and June, 1967 with elevations and peak discharges of 1078.5 feet at 5400 cfs and 1076.5 at 6800 cfs respectively. Reduced elevation despite greater flow was due to channel improvements which have been the only flood prevention measures. Primary use of the floodplain is agricultural although there is some industrial, municipal, and residential development that has been damaged in the past. Substantially more damage could be sustained in an Intermediate Regional Flood (IRF) or a Standard Project Flood (SPF) with crests of 1082.7 and 1085.9 feet respectively. Flood velocities, rates of rise, and durations could present greater hazards than previously. Velocities in the 1967 flood ranged from 6 to 11 feet per second; an SPF would have channel velocities up to 14.9 feet per second, which could cause considerable erosion, and overbank velocities up to 2.1 feet per second which could deposit debris from the river. These studies and predictions can be used as a basis for additional flood protection measures. (Park-North Carolina)
W75-10566

FLOOD PLAIN INFORMATION REPORT: SENECA CREEK, MONTGOMERY COUNTY, MARYLAND.
Army Engineer District, Baltimore, Md.
Prepared for Maryland-National Capital Park and Planning Commission, June, 1967. 13 p, 6 plates, 2 tab.

Descriptors: *Floods, Flood plains, *Flood protection, *Flood plain zoning, Planning, Land use, *Maryland, Flood proofing, Management.
Identifiers: *Floodplain management, *Seneca Creek(MD), Montgomery County(MD), Maryland-National Capital Park and Planning Commission.

Flood damages along Seneca Creek 15 miles northwest of Washington, D.C. at the time of this report were minor. The floodplain is primarily rural with the exception of the small town of Seneca on the Potomac at the creek mouth. July, 1956 was the major flood of record which caused four deaths and $200,000 to $300,000 in damage, generally to roads and bridges. Plates show the areas encompassed by the 1956 flood. A potential flood of 50-year frequency would vary little from this flood. The subdivision regulations of Montgomery County restrict development within the 50-year floodplain. Floodplain management recommended as a primary flood damage control measure should determine the limits of potential flood areas, provide access to flood-plain limits information, only plan development in floodplains of low-damage potential uses, and enforce existing laws and enact any new laws necessary to assure planned development in the floodplains. Cooperation and coordination of local, state, and federal policies is urged. A coordinated floodplain management program would reduce the demand for flood control structures which have already cost $5 billion for construction over the past 30 years. Preferable nonstructural alternatives are outlined. (Park-North Carolina)
W75-10567

FLOOD PLAIN INFORMATION: MILL RUN, BLAIR COUNTY, PENNSYLVANIA.
Army Engineer District, Baltimore.
Prepared for Blair County Planning Commission, Altoona, Pa. January, 1974. 22 p, 16 plates, 5 tab.

Descriptors: *Flood data, *Flooding, *Flood profiles, Flood damage, Flood forecasting, Flood protection, Flood recurrence interval, Flood peak, Flood discharge, Non-structural alternatives, Flash floods, Maximum probable flood, *Flood plain zoning, Flow duration, *Pennsylvania, Historic floods.
Identifiers: *Mill Run(Pa), Blair Co(Pa), Altoona(Pa), Standard Project Flood, Intermediate Regional Flood.

The probability and extent of future flooding along Mill Run in Blair County and the City of Altoona, Pennsylvania, is described to assist planners in minimizing vulnerability to flood damage through flood plain zoning, subdivision regulations, and flood protection works construction. The major flood of record occurred in 1936, although most property damage occurred in the September, 1967, flood. Residents report flooding in the Lleswen and Eldorado areas during 15 of the past 43 years. Flood determinations indicate that an Intermediate Regional Flood (IRF) would reach depths of 5.1 feet to 14.3 feet above streambed, and many of Altoona's bridges, residential areas, and light industrial areas would be inundated. Standard Project Floods (SPF) are not much higher, but the flooded areas and corresponding damage would be greater. There is also no definite flood season here. IRF water velocity ranges up to 14 ft/sec, but would be of short duration. The stream would rise from bankfull stage to its crest in 14 hours and return to its banks in less than 9 hours. No authorized flood control projects exist, and present zoning ordinances do not include flood plain zoning. (Grden-North Carolina)
W75-10568

SPECIAL FLOOD HAZARD INFORMATION REPORT: CHICKASAWHAY RIVER, WAYNESBORO, WAYNE COUNTY, MISSISSIPPI.
Army Engineer District, Mobile, Ala.
Prepared for Mississippi Research and Development Center, December, 1971. 10 p, 4 fig, 8 plates, 2 tab.

Descriptors: *Floods, *Flooding, *Flood plains, *Flood forecasting, Flood control, Flood protection, Historic floods, *Mississippi.
Identifiers: *Chickasawhay River(MS), Waynesboro(MS), Wayne County(MS), Intermediate Regional Flood, Standard Project Flood.

The Chickasawhay watershed in southeastern Mississippi drains an area of 2970 square miles. Within the 12-mile study reach its width varies between 100 and 250 feet with the bank height varying between 20 and 50 feet. The average slope is 0.7 feet per mile. The floodplain width varies from one to two miles. Development in the wide and flat floodplain at Waynesboro consists of residential areas interspersed with light industrial and commercial firms. Flood producing storms may occur anytime of the year. The major flood producing storms are usually of the frontal type which occur in winter and spring and last several days. Summer thunderstorms characterized by high intensities over small areas can cause flash flooding. A severe storm in summer or early fall can result from a tropical hurricane. No floodplain regulations exist. The largest flood occurred in April 1900 cresting at 170 feet, mean sea level (msl). The most recent flood on February 26, 1961 crested at 167.6 feet, msl. The 50-year flood and the Intermediate Regional Flood (IRF) would inundate the floodplain with the IRF affecting 3,700 acres of the 20,000 acres which comprise the Waynesboro Planning Area, with 400 acres flooded within the city limits. Floodplain management techniques to reduce damage are outlined. (Salzman-North Carolina)

W75-10569

FLOOD PLAIN INFORMATION: BROOKINGS, BROOKINGS COUNTY, SOUTH DAKOTA, VOLUME I - DEER CREEK.
Army Engineer District, Omaha, Neb.
Prepared for South Dakota Water Resources Commission and City of Brookings, April, 1973. 29 p, 22 fig, 10 plates, 4 tab.

Descriptors: *Flood plains, *Flood control, *Floods, *Flooding, Obstructions to flow, Flood forecasting, *South Dakota, Flood frequency, Flood damage, Flood protection.
Identifiers: *Deer Creek(SD), Brookings(SD), Intermediate Regional Flood(IRF), Standard Project Flood(SPF).

Development in the 95-square mile basin of Deer Creek, a tributary of the Big Sioux River in Brookings County, South Dakota, is largely agricultural, with 71% cropland, 23% pasture, and 6% other land uses. Brookings is the major city in the study area (population 13.717 in 1970) and development on its eastern border has resulted in pressure for residential development in the flood plain. Research from residents and newspapers has established the flood history of Deer Creek. Serious floods were reported nine times from 1881 to 1969 with April 21, 1881 and May 3, 1912 the highest. Magnitude data is unavailable. Flows are obstructed by trees and brush growing on the flood plain and banks. Projected floods at the upstream limits of the study area are computed at a 8,180 cfs discharge for the Intermediate Regional Flood (IRF) and 20,180 cfs for the Standard Project Flood. The greatest historical flood may have approached the IRF with its 100 year frequency. The study makes no flood protection recommendations but states that some have already been developed. Brookings County has a flood plain ordinance, but the City of Brookings does not yet, and the entire length of lower Deer Creek falls within the extraterritorial planning and zoning boundary of the City of Brookings. (Park-North Carolina)
W75-10570

FLOOD PLAIN INFORMATION: WHITE CLAY CREEK, NEW CASTLE COUNTY, DELAWARE.
Army Engineer District, Philadelphia, Pa.
Prepared for the New Castle County Department of Planning, June, 1972. 27 p, 12 fig, 13 plates, 19 tab.

Descriptors: *Flood plains, *Flood damage, *Land use, *Planning, Flood data, Flood stages, Historic floods, Obstruction to flow, Dams, Hurricanes, *Delaware, Urbanization.
Identifiers: *White Clay Creek(DE), *Christina River(DE), New Castle County(DE), Newark(DE), Hurricane Agnes, Comprehensive development plan, Intermediate Regional Flood, Standard Project Flood, Floodplain management, Tidal flooding.

The total drainage area of White Clay Creek, a major tributary of Christina River, is 162 square miles. The floodplain along the upper reach is narrow, wooded, and mostly undeveloped. Along the lower reach development of the relatively wide flat floodplain is more concentrated, including industrial and commercial development at Newark, Delaware. There are 5 dams with no significant storage capacity. Twelve bridges and stored flotable material might cause obstruction to flood flow. The main flood season is summer and early fall due to major storms. Marshland near the confluence of White Clay Creek and Christina River is also subject to tidal and fluvial flooding from the river. The highest recorded stage, 34.6 feet m.s.l.d., occurred in July 1937 and was influenced by backwater from an obstructive railroad bridge. The highest recorded peak flow is 9,020 cfs in June 1972, resulting from Hurricane Agnes. An Intermediate Regional Flood (IRF) would reach 30.9 ft. m.s.l.d. and 10,500 cfs and a Standard Project Flood (SPF) would reach 41.6 ft. m.s.l.d. and 40,800 cfs. Both types of future floods would result in inundation of residential, commercial, and industrial properties. A tentative Comprehensive Development Plan covering future development through 1985 has been developed. Along with this study it can serve as a basis for floodplain regulatory measures. (Diefendorf-North Carolina)
W75-10571

FLOOD PLAIN INFORMATION: SHABAKUNK CREEK, WEST BRANCH SHABAKUNK AND LITTLE SHABAKUNK CREEKS, MERCER COUNTY, NEW JERSEY.
Army Engineer District, Philadelphia, Pa.
Prepared for the Mercer County Planning Board and the New Jersey Department of Environmental Protection, October, 1973. 32 p, 9 fig, 34 plates, 8 tab.

Descriptors: *Flood plains, *Flood profile, *Flooding, *Flood forecasting, Obstructions to flow, Flood water, Tributaries, Flood protection, Flood recurrence interval, Flow characteristics, Flood damage, *New Jersey.
Identifiers: Mercer County(NJ), *Shabakunk Creek(NJ), Flood Hazard Area Design Flood(FHADF), Standard Project Flood(SPF).

Located near Trenton, New Jersey, Shabakunk Creek, West Branch Shabakunk Creek, and Little Shabakunk Creek are extensively developed for commercial uses near their mouths and residential use further upstream. More commercial development is projected which will increase the impervious surfaces along the flood plains and act as an obstruction to flood flows creating backwater during a flood. This is further complicated by trees and vegetation and materials stored along the creeks and the obstructive nature of many of the 51 bridges spanning the creeks. Forty bridges are obstructive to the Floodway Design Flood, 46 are obstructive to the Flood Hazard Area design Flood (FHADF) and 48 are obstructive to the Standard Project Flood (SPF). During an SPF water rises at a maximum rate of 1.8 ft/hr after overbank flooding occurs and can remain out of banks for as much as 1 1/2 days. The major floods of record were estimated from gage data on nearby Assunpink Creek in Trenton and are, in three out of four floods, related to hurricanes. Commercial and residential properties along the creeks have been severely damaged by floods in 1938, 1955, 1967, and 1971. Future floods would create even more damage inundating large portions of the Lawrenceville Shopping Center, overtopping roads, bridges and the tracks of the Reading Railroad. The projected FHADF (100 year recurrence interval) has a projected discharge of 2800 cfs and an elevation of 62.7 ft at the confluence of the West Branch with the Shabakunk Creek while the SPF would discharge 5500 cfs and have an elevation of 65.4 ft. generally 2 to 3 ft above the record flood of 1971. (Park-North Carolina)
W75-10572

FLOOD PLAIN INFORMATION: CATOMA CREEK, VICINITY OF MONTGOMERY, ALABAMA.
Army Engineer District, Mobile, Ala.
Prepared for the Central Alabama Regional Planning and Development Commission, April 1972. 18 p, 4 fig, 6 tab, 14 plates.

Descriptors: *Flood plains, *Flood control, *Flood damage, *Flood profiles, Flood data, Flood stages, Obstruction to flow, Historic floods, *Alabama, Land use, Planning.
Identifiers: *Catoma Creek(Alabama), *Aalabama River, Montgomery(Alabama), Floodplain management, Intermediate Regional Flood, Standard Project Flood.

Although most of the Catoma Creek floodplain is primarily agricultural or undeveloped, the pressure for future development is high due to its proximity to Montgomery, Alabama. With no existing controls, damage to agricultural and residential sections would be considerable in an Intermediate Regional Flood (IRF) and worse in a Standard Project Flood (SPF). More severe flood conditions on the lower reach of the creek will be produced by flooding of the Alabama River, of which Catoma Creek is a tributary, than from local floods on the Creek itself. Winter and spring are the major flood season, but floods can occure year-round from intense rainfall. Seven bridges and some vegetation create obstructions to flood flow. The U.S.G.S. stream gaging station at the U.S. Highway 331 bridge recorded the highest flood on Feb. 25, 1961, with an elevation of 179.7 ft, m.s.l. and a peak discharge of 48,600 cfs. Peak discharge of an IRF would be 61,000 cfs and of an SPF 104,000 cfs. Measured at the same gaging station, the elevation of an IRF would be 1.2 ft and of an SPF 4.6 ft above the 1961 elevation. (Diefendorf-North Carolina)
W75-10574

FLOOD PLAIN INFORMATION: UPPER RIVER ROUGE, MINNOW POND DRAIN, BELL BRANCH AND TARABUSI CREEK, WAYNE AND OAKLAND COUNTIES, MICHIGAN.
Army Engineer District, Detroit, Mich.
Prepared for the Water Resources Commission, Michigan Dept. of Natural Resources and Southeast Michigan Council of Governments, January, 1972. 70 p, 21 fig, 22 plates, 17 tab.

Descriptors: *Flood damage, *Flood forecasting, *Flood plains, *Historic floods, Obstructions to flow, Flood profiles, Flood stages, Flood data, Planning, Land use, Urbanization, *Michigan.
Identifiers: *Upper River Rouge(MI), Minnow Pond Drain(MI), Bell Branch(MI), Tarabusi Creek(MI), Wayne County(MI), Oakland Creek(MI), Floodplain management, Standard Project Flood(SPF), Intermediate Regional Flood(IRF), 50-year frequency flood, River Rouge(MI).

Four different water courses northwest of Detroit, Michigan, are studied: Upper River Rouge, Minnow Pond Drain, Bell Branch, and Tarabusi Creek. Most of the floodplain is limited to agricultural, recreational and residential uses. Floods caused by heavy rains usually occur at the same time on all 4 streams. Floods are characterized by rapid rate of rise and short duration. In total there are 52 bridges that can obstruct flow. A trend toward higher river flows and more frequent flooding due to urbanization is reflected by gage records kept since March 1958. The flood of record of all 4 creeks occurred in June 1968, with a peak discharge of 1730 cfs, only 60 cfs less than a 50-year frequency flood, at Five Mile Road on Upper River Rouge. At this point, an Intermediate Regional Flood (IRF) would produce 2210 cfs and a Standard Project Flood (SPF) 5170 cfs. An IRF would have stages ranging from .3 to 5.9 feet greater than June 1968 flood and an SPF would range up to 14.3 feet higher. The primary purpose of this information is to indicate probable risk of recurrent flooding thereby providing the basis for planning to minimize vulnerability. All communities within the study area have already adopted some type of floodplain regulation. (Diefendorf-North Carolina)
W75-10575

FLOOD PLAIN INFORMATION: WEST BRANCH SUSQUEHANNA RIVER, LYCOMING COUNTY, PENNSYLVANIA.
Army Engineer District, Baltimore, Md.
Prepared for Lycoming County Planning Commission, February, 1971. 37 p, 3 fig, 12 plates, 7 tab.

Descriptors: *Floods, *Flooding, *Flood profiles, *Flood data, Flood frequency, Flood forecasting, Flood flow, Flood peak, Flow, *Pennsylvania, *Flood plains.

Identifiers: *Susquehanna River(Pa), Williamsport(Pa), Bull Run(Pa), Lycoming County(Pa), Intermediate Regional Flood, Standard Project Flood, Susquehanna River.

Flooding on the West Branch of the Susquehanna River at Williamsport, Pa., is caused by intense widespread rainfall in the 6,214 square miles of the basin above the study area. Three-fourths of the land is uncleared, helping to retain runoff from heavy rains. Severe flooding can occur in late winter and early spring from heavy rains (40 inches annual average) and snowmelt (42 inches snowfall annually). The study area covers 13 miles of the West Branch in the Williamsport metropolitan area, including Moutoursville, Loyalsock, Williamsport, South Williamsport and Duboistown. Bull Run, a small tributary, is discussed separately. Much of the lowland near the river is still being farmed. Only secondary roads and railroad spur lines remain in the flood plain, which averages over a mile wide through the study area, since major rail and highway facilities have been either raised, moved, or are protected by levees or walls. Protection is afforded for the urbanized area up to the 1936 flood height by levees, walls, four upstream reservoirs. A county subdivision regulation including flood plain restrictions is being drafted since development is extending into unprotected areas. The major flood of record was in March, 1936, with a peak discharge of 264,000 cfs which covered 3,100 acres in Williamsport. Future floods of 220,000 cfs peak discharge at Williamsport gaging station for the Intermediate Regional Flood (IRF) and 407, 000 cfs peak discharge at the same gage for the Standard Project Flood (SPF) are predicted. The IRF profiles would be 1.9 feet lower than the 1936 flood profile while the SPF would be 7.2 feet higher at the upper limit of the study area. Flood velocities, up to 9-10 ft/sec in the channel and 4 ft/sec on the overbank, together with high water and long duration could cause millions of dollars of damage. (Park-North Carolina)
W75-10576

FLOOD PLAIN INFORMATION: FALLING CREEK, CHESTERFIELD COUNTY, VIRGINIA.
Army Engineer District, Norfolk, Va.
Prepared for the Chesterfield County Board of Supervisors, August, 1972. 31 p, 7 fig, 13 plates, 6 tab.

Descriptors: *Floods, *Flooding, *Flood control, *Flood profiles, Flood protection, *Flood plains, *Virginia.
Identifiers: *Falling Creek(Va), Chesterfield County(Va).

Falling Creek, located south of Richmond, Virginia, has a drainage area of 47 square miles. The stream flows in an easterly direction for 20 miles with a vertical drop of 250 feet before emptying into the James River. Flood plains are mostly undeveloped with residential property comprising major occupancy. Two stream gaging stations provided data showing that floods occur during all seasons resulting from heavy general rainfall as well as from thunderstorms or tropical storms in the summer or fall. Rising from low stages to extreme flood peaks in relatively short periods of time, floods are characterized by high velocity flows. Natural and manmade obstructions exist including a dam with no flood storage capacity. The greatest flood probably occurred on July 18, 1945. The highest recorded flood was September 12, 1960, cresting at 12.67 feet with a peak discharge of 2,510 cfs. The most recent flood crested at 10.39 feet on July 23, 1969. An Intermediate Regional Flood and Standard Project Flood would cause substantial damage to the flood plain with peak discharges of 9,900 cfs and 17,950 cfs respectively. This report furnishes a basin for the adoption of land use controls to guide flood plain development. (Salzman-North Carolina)
W75-10577

FLOOD PLAIN INFORMATION: JAMES RIVER, EAGLE ROCK TO LICK RUN, BOTETOURT COUNTY, VIRGINIA.
Army Engineer District, Norfolk, Va.
Prepared for Fifth Planning District Commission, June 1971. 39 p, 6 fig, 9 plates, 10 tab.

Descriptors: *Floods, *Flooding, Dams, *Flood profiles, *Virginia, *Flood control, Flood protection, *Flood plains.
Identifiers: *James River(Va), Jackson River(Va), Cowpasture River(Va), Botetourt County(Va), Eagle Rock(Va), Lick Run(Va), Intermediate Regional Flood, Standard Project Flood.

Jackson and Cowpasture Rivers join to form the James River about a mile north of Lick Run and 340 miles above its mouth. The James River flows through a winding channel with flood plain varying from a few hundred to several thousand feet in width in this study reach, its upper 18 miles. Several residential, commercial, and industrial properties as well as rural areas lie in the flood plain. Main flood season is from October through May, but floods with duration varying from several hours to several days can occur in any month due to intense local thunderstorms or tropical storms. Gathright Dam is being constructed 44 miles upstream from Lick Run on the Jackson River as the only flood control for the study area and should reduce floods by 3 feet. The greatest flood occurred in 1877 with a peak discharge of 120,000 cfs. The most recent flood occurred August 20, 1969 as the remains of Hurricane Camille dumped about 27 inches of rainfall on the James Basin in less than 6 hours. With a peak discharge of 58,500 cfs recorded on the James at Lick Run, homes, roads, railroads and bridges were destroyed and high waters in cities and towns caused millions of dollars in damages. With Gathright Dam operating, an Intermediate Regional Flood (IRF) and Standard Project Flood (SPF) on the James River at Lick Run would have peak discharge of 62,300 cfs and 177,000 cfs respectively. An IRF could rise 21.3 ft in 22 hours remaining above bankfull for 57 hours; maximum velocity could be 9.6 ft/sec in the channel (mile 339.7), 3.8 ft/sec overbank (mile 322.0). The SPF could rise 33.8 ft in 36 hours remaining above bankfull 142 hours; maximum velocity could be 15.6 ft/sec in the channel (mile 332.5), 6.9 ft/sec overbank (mile 322.0). (Salzman-North Carolina)
W75-10578

FLOOD PLAIN INFORMATION: JOHNSON CREEK AND TRIBUTARY, CHESTERFIELD COUNTY, VIRGINIA.
Army Engineer District, Norfolk, Va.
Prepared for the Chesterfield County Board of Supervisors, September, 1973. 23 p, 8 fig, 11 plates, 4 tab.

Descriptors: *Floods, *Flooding, *Flood control, *Flood forecasting, Flood protection, Flood plains, *Virginia, *Flood plains.
Identifiers: *Johnson Creek(Va), Chesterfield County(Va), Intermediate Regional Flood, Standard Project Flood.

Johnson Creek, located south of Richmond, Virginia, has a drainage area of about 9 square miles at its mouth. Flowing in an easterly direction for 6 miles before emptying into the James River which causes backwater effects in the lower reaches, the creek slopes at an average of 20 feet per mile. Although the channel is clear of vegetation, overbank areas are highly vegetated with sparse development on the flood plains. Increasing population in the nearby Richmond area will create pressure for building on flood plains of Johnson Creek and its tributaries. Because no stream gages exist on Johnson Creek, data was collected from similar streams in the vicinity. Floods, caused by heavy general rainfall, occur during all seasons, and are characterized by rapidly rising flood stages in a relatively short time. Larger and more infrequent floods result from intense local thunderstorms or hurricanes in summer or fall. Natural and manmade obstructions, including bridges and culverts, impede flood flows. Although no flood damage reduction measures exist, flood studies are required before approval of subdivisions and site development plants. The largest flood probably occurred on July 18, 1945. The most recent flood on June 7, 1972 resulted in considerable damage. An Intermediate Regional Flood and Standard Project Flood would result in inundation of the flood plain with peak discharges at the mouth of Johnson Creek of 5,280 cfs and 9,230 cfs respectively. Substantial damage to residential property, streets, roads, utilities would result from either an IRF or an SPF. Plates detail expected water surface elevations and lateral extent of these floods. (Salzman-North Carolina)
W75-10579

FLOOD HAZARDS IN THE SEATTLE-TACOMA URBAN COMPLEX AND ADJACENT AREAS, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 7C.
W75-10580

HYDROLOGIC RECONNAISSANCE OF THE SOUTHERN UINTA BASIN, UTAH AND COLORADO,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 3B.
W75-10585

A COMPARISON OF METHODS FOR ESTIMATING FLOOD PEAKS ON STREAMS IN MASSACHUSETTS,
Geological Survey, Boston, Mass.
G. D. Tasker.
Boston Society of Civil Engineers Journal (ASCE), Vol 62, No 1, p 9-19, April 1975. 4 fig, 2 tab, 9 ref.

Descriptors: *Floods, *Flood peak, *Streamflow, *Massachusetts, Flood forecasting, Methodology, Flood frequency, Curves, Flow profiles, Correlation analysis, Evaluation.
Identifiers: *Estimating flood peaks.

Modifications of the Potter method (Potter, 1957) and the Small Basin Study (SBS) method (Johnson and Tasker, 1974) for estimating flood peaks from basin characteristics are used to predict the 50- and 10-year peak discharges at 77 continuous and partial-record gaging stations in Massachusetts. The predicted peaks made by each method are compared with the peak discharge estimated from station frequency curves for each station. Results indicate that, while the random error for both methods is about the same, the modified Potter method systematically predicts peaks which are substantially higher (150 percent) than those estimated from station frequency curves. (Woodard-USGS)
W75-10587

REPORT ON THE RIVER MASTER OF THE DELAWARE RIVER FOR THE PERIOD DECEMBER 1, 1973-NOVEMBER 30, 1974,
Geological Survey, Reston, Va.
J. V. B. Wells, and R. E. Fish.
June 1975. 87 p, 3 fig, 1 plate, 19 tab.

Descriptors: *Delaware River Basin Commission, *Delaware River, *Streamflow, *Water management, Reservoirs, Estuaries, Data collections, Monitoring, Water quality, Saline water intrusion, Precipitation(Atmospheric), Water temperature, River basin development.

The 1974 annual report year, December 1, 1973 to November 30, 1974, of the Delaware River Master was a year of excessive precipitation and much above average runoff. Pepaction, Cannonsville, and Neversink Reservoirs of the City of New

York spilled for many months. The annual flow of the Delaware River at Montague adjusted for change in reservoir storage and diversions, was 39% above median and the third highest for the period of record beginning 1940. Diversions and releases from the reservoirs of the city of New York were made within the terms of the Amended Decree of the U.S. Supreme Court, dated June 7, 1954. Diversions by New Jersey through the Delaware and Raritan Canal were within prescribed limits of the Amended Decree. The combined usable contents of Pepacton, Cannonsville, and Neversink Reservoirs on November 30, 1974 was the greatest for November 30 since 1967. Precipitation on the basin above Montague for the 1974 report year was excessive, totaling 52.18 inches, which was the third highest for a report year in the period of record beginning December 1940. Excessive precipitation and runoff during December caused Cannonsville Reservoir to fill and caused the contents of Pepacton and Neversink Reservoirs to increase rapidly. All reservoirs spilled by April. The actual uncontrolled runoff plus actual powerplant releases during the period July 12 to September 2 totaled 98,503 cfs-days. The advance estimate for those days was 77,290 cfs-days. The net cumulative difference between the estimate and actual was -22%. Streamflow in the Delaware River estuary for 8 months of the reporting period retained the salinity front seaward; furthermore, the increased flows were conducive to lowering temperatures during the summer months and raising dissolved-oxygen levels. (Woodard-USGS)
W75-10589

PROBLEMS RELATED TO WATER QUALITY AND ALGAL CONTROL IN LOPEZ RESERVOIR, SAN LUIS OBISPO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5B.
W75-10601

HYDROLOGY OF THE ALBEMARLE-PAMLICO REGION, NORTH CAROLINA--A PRELIMINARY REPORT ON THE IMPACT OF AGRICULTURAL DEVELOPMENTS,
Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 4C.
W75-10602

WATER RESOURCES OF THE TOPPENISH CREEK BASIN, YAKIMA INDIAN RESERVATION, WASHINGTON.
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 3F.
W75-10603

LOW-FLOW CHARACTERISTICS OF MISSISSIPPI STREAMS,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 2E.
W75-10605

VALLEY DESIGN IN URBAN GROWTH CENTRES,
University of New South Wales, Kensington (Australia). Faculty of Military Studies.
For primary bibliographic entry see Field 6B.
W75-10643

PROGRESS IN AUSTRALIAN HYDROLOGY 1965-1974.
For primary bibliographic entry see Field 2A.
W75-10646

PREDICTING THE CONCENTRATION OF AQUATIC HERBICIDE RESIDUES IN WATERWAYS,
Commonwealth Scientific and Industrial Research Organization, Griffith (Australia). Div. of Irrigation Research.
For primary bibliographic entry see Field 5B.
W75-10648

CANOPY WEIGHT DISTRIBUTION AFFECTS WINDSPEED AND TEMPERATURE IN A LODGEPOLE PINE FOREST,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
H. L. Gary.
Forest Science, Vol 20, No 4, p 369-371, December 1974. 1 fig, 10 ref.

Descriptors: *Biomass, *Air temperature, Transpiration, Forest management, *Wyoming, Measurement, *Canopy, *Lodgepole pine trees.
Identifiers: *Windspeed.

Weight distribution of needles plus branches approximated a normally distributed population for 10 randomly selected trees in an 80-year-old stand in southern Wyoming. Windspeeds were minimum and mid-day air temperatures maximum in the mid-canopy region where needles and branch weight were concentrated. (Forest Service)
W75-10654

A NUMERICAL MODEL FOR PREDICTING THE EFFECTS OF LANDSLIDE-GENERATED WATER WAVES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8A.
W75-10661

NORTON POINT DIKE STUDY, CONEY ISLAND, NEW YORK; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W75-10662

WAIMANO STREAM FLOOD CONTROL PROJECT, PEARL CITY, HAWAII; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W75-10663

FLOOD CONTROL PROJECT ON LYTLE AND WARM CREEKS AND SANTA ANA RIVER, CALIFORNIA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W75-10668

THE EFFECTS OF URBANIZATION ON FLOODS OF DIFFERENT RECURRENCE INTERVAL,
University Coll., London (England). Dept. of Geography.
For primary bibliographic entry see Field 4C.
W75-10709

FINANCING WATER WORKS,
Studley Shupert and Co., Inc., Boston, Mass.
For primary bibliographic entry see Field 3D.
W75-10712

WATER WORKS IMPROVEMENTS--SPRINGFIELD, VERMONT,
Dvfresne-Henry Engineering Corp., North Springfield, Vt.
For primary bibliographic entry see Field 3D.
W75-10713

DETERMINE URBAN RUNOFF THE SIMPLE WAY,
Montreal Urban Community (Quebec). Water Purification Dept.
For primary bibliographic entry see Field 2E.
W75-10716

ANALYSIS OF A LARGE WATER DISTRIBUTION SYSTEM USING ADVANCED COMPUTER SOFTWARE,
Orlando Utilities Commission, Fla.
R. E. Savarese, and D. G. Simmons.
Public Works, Vol 104, No 12, p 60-61, Dec 1973.

Descriptors: *Water distribution(Applied), *Distribution systems, *Computer models, *Systems analysis, Hydrostatic pressure, Pipelines, Utilities, Simulation analysis, Water demand, Water management(Applied), Computer programs, Design criteria, Florida.
Identifiers: *Orlando(FL), Hardy Cross Network Analysis, 'Water X' Program.

A new computer software system, the 'Water X' program, is a vast improvement over the pure 'Hardy Cross Network Analysis' programs. The Orlando, Florida, water distribution system was analyzed without making excess demands on manual or computer time. This large system, including 7 pumping stations and 6 elevated storage tanks, required a basic model of 190 junctions and 500 pipes from 12 to 36 inches in diameter to simulate the system of transportation mains. A model of this size cannot easily be manipulated with manual calculations to examine alternative configurations and flow demands and cost up to $150 for an average computer analysis run. The extra accuracy of input data needed to avoid costly false starts was achieved with a checking program which reduced checking time by 90%. The network analysis software was also made 'self-starting'; the user is not required to assign initial estimated flows for each pipe. Non-converging systems were encountered in which the computer was unable to assign flow and pressure distributions to a hypothetical configuration of water distribution hardware. Simplifying the model aided convergence. This sort of program provides management with testing capability for present and proposed designs. All parameters such as elevated tank heads, flow demand patterns, and pipe sizes can easily be varied to suit the engineer's requirements and then tested by computer simulation. (Herr-North Carolina)
W75-10720

WATER COLLECTION AND STORAGE DISPERSION APPARATUS,
F. R. Walcott.
US Patent No 3,890,934, 4 p, 7 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 935, No 4, p 1449, June 24, 1975.

Descriptors: *Patents, *Water storage, *Water supply, *Rainfall, *Wildlife conservation, Rainwater, Storage tanks, Equipment.
Identifiers: Module construction.

A modular apparatus is disclosed which collects, stores and dispenses rainwater to wildlife. The apparatus includes an elongated storage tank having a central depression into which ducts discharge water. The tank and ducts are composed of panels arranged with respect to each other to provide a path for rainfall water to follow. The tank has slotted rails which receive the edges of the panels thus constructing an enclosure for storage of the water gathered via the panelled ducts. A gravity

feed dispensing unit is remotely connected to the storage tank by a flexible hose provided with a conventional float valve mechanism. The dispensing unit includes an opening exposing a quantity of the storage water for wildlife drinking purposes. The modular construction allows the apparatus to be transported to remote areas for installation and usage. (Sinha-OEIS)
W75-10727

GEOTHERMAL CHANNEL AND HARBOR ICE CONTROL SYSTEM,
A. T. Van Huisen.
U.S. Patent No. 3,889,473, 5 p, 9 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 935, No 3, p 965, June 17, 1975.

Descriptors: *Patents, *Geothermal studies, *Temperature, *Thawing, *Ice cover, Heat flow, Arctic, Polar regions, Transportation.
Identifiers: Sea passage, Shipping channels.

A method of forming an open shipping channel between two navigable bodies of water separated by a frozen ice barrier is described. A number of geothermal wells are drilled through the surface of the earth lying beneath the ice and water into a deep, hot rock geothermal subsurface strata spaced along a route joining the bodies of water. The heated fluid at a temperature of at least 100 deg F is transferred from the lower hot end of each well to a surface of the frozen ice barrier in an amount sufficient to melt the frozen ice barrier until the frozen ice barrier melts to form a water filled channel joining the wells and the bodies of water into a continuous open, navigable shipping channel at least 80 feet in width. At least one side of the channel is lined with a wall of thermal insulating material extending above the wave and water line. (Sinha-OEIS)
W75-10734

AGRICULTURAL AND URBAN CONSIDERATIONS IN IRRIGATION AND DRAINAGE.
American Society of Civil Engineers, New York.
Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, 1974. 800 p, $12.00.

Descriptors: *Conferences, *Irrigation, *Drainage, *Water utilization, *Water quality, Weather modification, Groundwater, Irrigation operation and maintenance, Irrigation systems, Automatic control, Watershed management, Surface drainage, Drainage effects, Irrigation effects, Environmental effects, Irrigation water, Urban drainage, Drainage systems, Pumping, Watersheds(Basins), Economics.

The conference objective was to explore many of the questions of the interdependencies between urban and irrigation water use. The twelve broad subjects discussed were groundwater, changing water use, weather modification, drainage by pumping, operation and maintenance, efficient irrigation, automatic controls, agricultural and urban considerations, suburban drainage, water utilization, irrigation water requirements, and water quality. (See also W75-10770 thru W75-10805) (Humphreys-ISWS)
W75-10769

SEEPAGE FROM RECHARGE AND LANDFILL DITCHES,
California Univ., Berkeley. Dept. of Geological Engineering.
For primary bibliographic entry see Field 5B.
W75-10770

ECONOMIC IMPACT OF THE CONVERSION OF WATER FROM IRRIGATION TO MUNICIPAL AND INDUSTRIAL USE IN THE RIO GRANDE BASIN OF NEW MEXICO,
New Mexico State Engineer, Santa Fe.
For primary bibliographic entry see Field 6D.
W75-10771

IMPACTS OF RURAL TO URBAN WATER USE,
Texas Office of the Governor, Austin. Water Task Force.
For primary bibliographic entry see Field 6D.
W75-10772

THE PERIMETER CANAL - A NEW APPROACH TO DISCHARGE URBAN WATER INTO A COASTAL MANGROVE AREA,
Greiner (J.E.) Co., Inc., Tampa, Fla.
C. H. King, Jr., and G. M. Ward.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 99-129, 1974. 13 fig, 1 tab, 5 ref.

Descriptors: *Canals, *Inland waterways, *Urban runoff, *Florida, Coastal plains, Hydraulic structures, Conveyance structures, Estuarine environment, Mangrove swamps, Bays.
Identifiers: *Cape Coral(Fla), Perimeter canal.

Following a general evaluation of the hydrologic environment in and around Cape Coral, Florida, the discussion turned to the need for and the design of a perimeter canal for conveyance of storm water, It was anticipated such a feature would overcome adverse affects to marine bay ecosystems when freshwater enters tidewater. The perimeter canal was designed to: (1) collect runoff, (2) provide for sediment deposition, (3) encourage salt and fresh water mixing, (4) preserve natural sheet flow to the vegetative zone, (5) remove nutrients, (6) provide recreation and navigation opportunities, and (7) provide a buffer between development and the preserved mangrove zone. Design parameters were presented and a map showed the canal's route. (See also W75-10769) (Jess-ISWS)
W75-10773

PRIORITY PROBLEMS FOR MODIFYING CUMULUS PRECIPITATION,
Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.
For primary bibliographic entry see Field 3B.
W75-10774

WEATHER MODIFICATION FOR USE IN THE HIGH PLAINS,
South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
For primary bibliographic entry see Field 3B.
W75-10775

USERS' VIEW OF WEATHER MODIFICATION,
Kansas State Senate, Topeka. 39th District.
For primary bibliographic entry see Field 3B.
W75-10776

ROLE OF THE PUBLIC IN WEATHER MODIFICATION,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 3B.
W75-10777

GROUNDWATER CONTROL BY PUMPING,
Central Nebraska Public Power and Irrigation District, Holdrege.
For primary bibliographic entry see Field 4B.
W75-10778

CHANGE IN QUALITY OF PUMPED DRAINAGE EFFLUENT,
Bureau of Reclamation, Aurora, Colo.
For primary bibliographic entry see Field 5B.
W75-10779

DRAINAGE ANALYSIS OF A CONFINING FORMATION,
Agricultural Research Service, Mandan, N. Dak. Northern Great Plains Research Center.
L. C. Benz, and E. J. Doering.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 225-250, 1974. 8 fig, 2 tab, 8 ref.

Descriptors: *Saline soils, *Artesian aquifers, *Water table, *Drainage, *North Dakota, Pumping, Drawdown, Sandstones, Aquicludes, Glacial drift, Water wells, Slopes, Hydraulic properties, Artesian heads, Observation wells, Hydraulic gradient, Equations, Heat flow, Diffusivity, Piezometers, Curves.

A poorly drained saline area covers 400,000 acres in northeastern North Dakota in the Red River Valley. The upward flow of saline water into a thick overburden of glacial till and lacustrine sediments has created and sustained soil salinity and a high water table. Pumping from the artesian formation reduces hydraulic head in the aquifer, but the response in the glacial till and lacustrine sediments is very slow. It was shown that lowering the water table 2 feet with an aquifer drawdown of 32 feet when the hydraulic diffusivity was 1.44 sq ft/day would require continuous pumping for 5.3 years. The time required to effect hydraulic head redistribution (and water table control) is very dependent upon the hydraulic diffusivity of the overburden. Pump drainage to relieve the high water table and salinity was shown to be feasible even though continuous pumping would be required. A drainage system of 11 wells, pumped at a rate of 500 gallons per minute or less per well, would be adequate and would have an annual cost of $0.34 per acre. (See also W75-10769) (Visocky-ISWS)
W75-10780

GROUNDWATER MODEL AS A TOOL IN PLANNING AND MANAGEMENT,
CH2M/Hill, Portland, Oreg.
For primary bibliographic entry see Field 4B.
W75-10781

A CRITERION FOR VEGETATION STIFFNESS,
Waterloo Univ. (Ontario). Dept. of Civil (Engineering.
N. Kouwen, and A. Harrington.
In: Agricultural and Urban Considerations, in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 273-284, 1974. 6 fig, 1 tab, 4 ref, 1 append.

Descriptors: *Streamflow, *Vegetation effects, *Stream gages, Vegetation, Retardance, Weeds, Grasses, Velocity, Measurement, Laboratory tests, Roughness(Hydarulic), Channel flow, Hydarulics.
Identifiers: *Vegetation stiffness.

When water or air flows over a flexible vegetation, the vegetation will bend and thereby reduce its height. In an open channel which is lined with such vegetation, the roughness of the channel walls and channel bed is very much affected by the flexural rigidity of the vegetation. For instance, when the vegetation is in an erect position it has a very much higher retardance effect than when it is prone, even though the relative roughness may be equal (using the channel bed as the limit of the cross-section). It is therefore important to know under which conditions the vegetation can be expected to be prone or erect. The growth of weeds in rivers and canals is sometimes desirable and at other times cannot be avoided. Problems arise such as

loss of capacity in irrigation or drainage canals and uncertainty in interpolating flows at stream gaging sites infested with weeds. This paper pointed out how previously published work could be applied to practical situations. (See also W75-10769) (Sims-ISWS)
W75-10782

WELLTON-MOHAWK DRAINAGE AND THE MEXICAN SALT PROBLEM,
Wellton-Mohawk Irrigation and Drainage District, Ariz.
C. C. Tabor.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 285-309, 1974. 9 fig.

Descriptors: *Irrigation, *Drainage, *Water quality, *Arizona, *Mexico, *Colorado River, Mexican Water Treaty, Salinty, Drainage water, Drainage systems, Drainage wells, Water reuse, Groundwater, Subsurface drainage, River systems, Irrigation systems, Drainage practices, Water policy, Governments, Political aspects, Drainage programs.
Identifiers: *Wellton-Mohawk drainage, *Mexicali Valley, *San Luis Valley, Gila Project.

The Wellton-Mohawk Division of the Bureau of Reclamation's Gila Project straddles the Gila River in southwestern Arizona. The project was authorized by Congress after World War II and first delivered water from Imperial Dam on the Colorado River in 1952. It was decided at the time of construction of the irrigation system that the drainage works should be delayed until there was an actual need. Later, a system of pumped drainage was constructed which keeps the groundwater mostly below the root zone of the crops. The drainage water was allowed to flow into the old channel of the Gila River and thence into the Colorado. The first effluent came out of this channel in 1961. Soon after, objections were made by Mexican interests that the salt level of Colorado River water delivered to Mexico at Morelos Dam has been 3000 and 4000 parts per million due to drainage from the Wellton-Mohawk Irrigation and Drainage District, that thousands of acres of farm land in the Mexicali Valley have gone out of production due to this high saline water, and that lack of drainage in Mexicali Valley has nothing to do with the problem. It was argued in this paper that the salt levels are much less than claimed. The decrease in cotton production on Mexican farms was ascribed largely to the arrival of the pink bollworm and to water-logged fields due to poor drainage. Mexico has recently begun a rehabilitation program of canal lining and drainage improvements which should help the situation considerably. Also, there are planned revisions in the U.S. system which should improve the quality of the Colorado River water. (See also W75-10769) (Sims-ISWS)
W75-10783

DEVELOPMENT OF LARGE SCALE DRIP IRRIGATION SYSTEMS,
Superior Farming Co., Bakersfield, Calif.
For primary bibliographic entry see Field 3F.
W75-10784

WATER USE AND PRODUCTION OF TRICKLE IRRIGATED ONIONS,
New Mexico State Univ., University Park. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W75-10785

SOME FACTORS AFFECTING CONTROL OF FLOW IN A LARGE CANAL SYSTEM,
California Univ., Davis. Hydraulics Lab.
For primary bibliographic entry see Field 8B.
W75-10786

CURRENT WATER SYSTEMS AUTOMATION RESEARCH AND DEVELOPMENT IN THE BUREAU OF RECLAMATION,
Bureau of Reclamation, Denver, Colo.
For primary bibliographic entry see Field 8C.
W75-10787

AUTOMATION OF AN EXISTING IRRIGATION SYSTEM - PART I,
Modesto Irrigation District, Calif.
For primary bibliographic entry see Field 8C.
W75-10788

FLOAT VALVE PROVIDES VARIABLE FLOW RATES AT LOW PRESSURES,
California Polytechnic State Univ., San Luis Obispo. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 8C.
W75-10789

WATERSHED BEHAVIOR AFTER FOREST FIRE IN WASHINGTON,
Forest Service (USDA), Wenatchee, Wash. Forest Hydrology Lab.
For primary bibliographic entry see Field 4C.
W75-10790

NEW CONCEPTS IN SUBURBAN DRAINAGE IN FLORIDA,
Diaz, Seckinger and Associates, Inc., Tampa, Fla.
K. A. Bryant, Jr., and J. N. Krider.
In: Agricultural and Urban Considerations In Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 471-500, 1974. 13 fig, 9 ref, 1 append.

Descriptors: *Hydraulic design, *Florida, Design, Design standards, Soil surveys, Runoff, Detention reservoirs, Land development, Drainage, Construction.
Identifiers: *Tampa Bay area(Fla), Runoff models.

Preliminary investigation and final design criteria for a 100-acre subdivision were presented. The development, a 'bedroom' community, is located in the Tampa Bay area of Florida. All steps taken from preliminary investigation through final design were outlined. The discussion included the use of a runoff model and design of a detention basin and its outlet works. Several phases of actual construction were also mentioned. (See also W75-10769) (Jess-ISWS)
W75-10793

EFFECTS OF SURFACE DRAINAGE ON STREAM FLOW,
Conservation Service, Temple, Tex.
H. N. McGill, A. C. Bennett, W. B. Moody, and G. C. Vittetoe.
In: Agricultural and Urban Consideration In Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 501-510, 1974. 1 fig, 1 tab, 8 ref.

Descriptors: *Engineering structures, Rainfall-runoff relationships, *Streamflow, Runoff, Peak discharge, *Hydrographs, Discharge(Water), Surface drainage, Routing, Drainage systems, *Texas.
Identifiers: *Cedar Lake Creek(Tex), Drainage improvements, Resultant discharge.

A procedure for analyzing the effects of drainage works of improvement on downstream peak discharges was presented. Hydrographs were developed for incremental areas of the watershed for conditions without and with drainage measures. These were routed and combined through the stream course. (See also W75-10769) (Jess-ISWS)
W75-10794

ENVIRONMENTAL ISSUES, EFFECTS, AND SOLUTIONS,
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 6G.
W75-10795

EVALUATION OF AGRICULTURAL DRAINAGE IN WATER QUALITY MANAGEMENT,
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 5G.
W75-10796

ART OF AGRICULTURAL DRAINAGE DESIGN AND COSTS,
Wright Water Engineers, Inc.; Denver, Colo.
R. L. Toren.
In: Agricultural and Urban Considerations In Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 557-574, 1974. 1 tab.

Descriptors: *Drainage systems, *Drainage engineering, *Tile drainage, *Sewage effluents, *United States, Drainage practices, Engineering, Costs, Construction costs, Farm management, Lateral conveyance structures, Pipes, Outlets, Tiles, Filters, Subsurface drainage, Agricultural engineering, Agriculture, Sewage disposal, Irrigation, Drainage, Foreign countries, Specifications.

Answers to a questionnaire received from 37 drainage engineers throughout the United States and various other countries showed that the design and costs of subsurface drainage systems for agricultural drainage vary considerably. In the humid sections of the United States, especially in the Midwest, drains are often placed on top of the glacial till which is, at times, only 24 inches below the surface. Cohesive soils characterize the profile of the upper two and three feet and a gravel filter usually is not specified. Drain spacings may vary from 30 to 60 feet. Material and construction costs may be as low as 20 cents per lineal foot for a 4-inch drain 30 to 60 inches deep. In the arid west, the depth to the drain is normally 5 to 8 feet deep, and drains are spaced as close as 75 feet and as far apart as 600 feet. Gravel filters are invariably specified and average material and construction costs vary from 75 cents to $1.75 per lineal foot for a 4-inch drain with a gravel filter. Average installed costs for a 6-inch drain, 6 to 8 feet deep, vary from 85 cents to $5.30 per lineal foot. Drainage engineers are generally receptive to the practice of renovating sewage effluent on agricultural land. (See also W75-10769) (Sims-ISWS)
W75-10797

UTILIZATION OF SEWAGE EFFLUENT FOR IRRIGATION,
For primary bibliographic entry see Field 5D.
W75-10798

EFFECTIVENESS OF PRECIPITATION IN A MOUNTAIN MEADOW,
Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 2D.
W75-10799

IRRIGATION MANAGEMENT FOR SALT CONTROL,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
For primary bibliographic entry see Field 3C.

W75-10800

TRICKLE IRRIGATION DESIGN REQUIREMENTS FOR ROW CROPS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 3F.
W75-10801

EFFECTS OF FARMING - URBAN DRAINAGE ON FRESH WATER,
Orange County Pollution Control Dept., Orlando, Fla.
For primary bibliographic entry see Field 5G.
W75-10802

FIVE YEAR STUDY OF DES MOINES RIVER WATER QUALITY,
Iowa State Univ., Ames. Engineering Research Inst.
For primary bibliographic entry see Field 5B.
W75-10803

PROBLEMS OF WATER QUALITY MANAGEMENT IN WESTERN RIVER BASIN SYSTEMS,
California Univ., Los Angeles. Coll. of Engineering.
For primary bibliographic entry see Field 5G.
W75-10804

EFFECT OF AGRICULTURAL USE ON WATER QUALITY FOR DOWNSTREAM USE FOR IRRIGATION,
Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering.
For primary bibliographic entry see Field 5G.
W75-10805

TOWARDS A SHARPER CONCEPT OF AN ACTION VARIABLE,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 6A.
W75-10813

OPTIMAL SIZING OF URBAN FLOOD-CONTROL SYSTEMS,
Hydrologic Engineering Center, Davis Calif. Planning Analysis Branch.
D. W. Davis.
Journal of the Hydraulics Division, Proceedings of ASCE, Vol 101, No HY8, Proceedings Paper no 11490, p 1077-1092, August 1975. 5 fig, 1 tab, 9 ref.

Descriptors: *Flood control, Water resources, *Simulation analysis, *Computer models, *Urbanization, Planning, Hydrology, Size, *Optimization, Methodology, Drainage, Costs, Reservoirs, Storage, Pumping plants, Diversion, Rainfall-runoff relationships, Equations, Mathematical models, Systems analysis, Model studies.
Identifiers: Economic analysis, Benefit maximization, Social costs, Minimization, Automatic search procedure, Univariate gradient procedure, Newton-Raphson convergence procedure, Systems engineering.

Optimal sizes for components of urban flood-control systems can be determined from a detailed simulation analysis controlled by an optimization methodology. Flood-control measures within urban areas frequently consist of complex systems of detention storage reservoirs, channel modifications, levees, land-use controls, flood proofing, and pumping facilities. The optimal size of each of these system components depends on the system interaction with other components and the hydrologic, economic, environmental, and other performance outputs of the system. A technique has been developed and programmed for an existing simulation model that automatically determines the sizes of urban flood-control components of detention storage, flow diversions, and pumping plants, the objective being to maximize system net benefits subject to accompiishment of hydrologic performance targets and to minimize social costs. The system is simulated using hydrologic data, component cost and performance functions, and flow damage information at damage centers. Utilized also are an automatic search procedure--the univariate gradient procedure--and the Newton-Raphson convergence procedure. (Bell-Cornell)
W75-10821

COMPUTER SIMULATION OF WATER DISTRIBUTION NETWORKS,
Boeing Computer Services, Inc., Seattle, Wash. Mathematicals and Modeling Unit.
C. R. Gagnon, and S. L. S. Jacoby.
Transportation Engineering Journal, American Society of Civil Engineers, Vol 101, No TE3, Proceedings paper No 11515, p 553-567, August 1975. 4 fig, 26 ref.

Descriptors: *Water distribution(Applied), *Simulation analysis, *Computer models, *Network design, *Pipelines, *Transportation, Computer programs, Digital computers, Mathematical models, Equations, Systems analysis, Flow, Model studies.
Identifiers: Implicit loop method, Newton-Raphson method, Iteration, Computation, Operating conditions, Automatic search technique, Nonlinear equations, Remote terminals.

Simulating the performance of water distribution systems on computers helps to improve their design. The two principal phases of a new method--the 'implicit loop method'--for this simulation problem are described. The first phase consists of generating on the computer a network computational model. In the second phase, this computational model is used in an iterative modified Newton method to solve the simulation problem. Detailed information about the method is given from which the reader can produce a computer program. An implementation of the method is described which uses the interactive capability afforded by remote terminals. The implicit loop method for analyzing water distribution networks is very flexible and readily adaptable to a variety of networks, designs, and operating conditions. The method requires a minimum of input data, is particularly well-suited to digital computations, and is exceptionally well-suited to provide input error diagnostics. All this makes the use of interactive computing techniques with remote terminals practical, reliable, and highly cost effective. (Bell-Cornell)
W75-10823

DERIVATION OF RESERVOIR OPERATING RULES BY ECONOMIC ANALYSIS,
Kentucky Water Resources Inst., Lexington.
C. O. Dowell.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 545, $5.75 in paper copy, $2.25 in microfiche. Research Report No 6, 1967. 116 p, 24 fig, 20 tab, 21 ref. OWRR A-006-KY. 14-01-0001-787.

Descriptors: Reservoirs, *Reservoir operation, *Flood control, Economics, *Recreation, *Operating costs, Storage capacity, *Kentucky, *Benefits, Water supply, Water level fluctuations.

A methodology was developed for determining an optimum set of reservoir operating rules specifying the monthly allocation of storage space based on the example of Rough River Reservoir, a Corps of Engineers project in Breckinridge and Grayson Counties, Kentucky, and assuming this multipurpose reservoir provides flood control, water supply, and recreation. The operating rules were derived by the method of marginal analysis which uses as its criteria achievement of maximum net benefits from the available storage capacity. Benefit relationships were derived for each use. The variation of flood control benefits with available flood storage was determined from Corps of Engineers stage-damage curves and statistical analysis of the historical storms in the area. The variation of water supply yield with the allowable water surface fluctuation within the reservoir was determined by using statistical properties of past stream-flow to synthesize a month-by-month operation of the reservoir. Recreation benefits as they varied with available storage were determined for five levels of annual visitation (up to twice the present value) by sub-dividing use among three activity types and estimating how each type of use would be affected by a fluctuation of water level. (Huffsey-Kentucky)
W75-10825

ANALYSIS OF RESERVOIR RECREATION BENEFITS,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 6B.
W75-10826

THE EFFECT OF LANDOWNER ATTITUDE ON THE FINANCIAL AND THE ECONOMIC COSTS OF ACQUIRING LAND FOR A LARGE PUBLIC WORKS PROJECT,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 6B.
W75-10827

REVIEW OF THE ECONOMIC BENEFITS AND COSTS RESULTING FROM DEWEY RESERVOIR,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 6B.
W75-10828

4B. Groundwater Management

HYDRAULIC BEHAVIOUR OF THE CHALK AQUIFER IN THE YORKSHIRE WOLDS,
Institute of Geological Sciences, London (England). Dept. of Hydrogeology.
S. S. D. Foster, and R. I. Crease.
The Institution of Civil Engineers Proceedings, Part 2, Research and Theory, Vol 59, p 181-188, March 1975. 4 fig, 10 ref.

Descriptors: *Groundwater, *Aquifer characteristics, *Aquifer testing, Groundwater availability, Hydrogeology, Transmissivity, Specific yield, Pumping, Water table aquifers, Wells, Streamflow, Flow augmentation, Cores, Laboratory tests, Permeability, Flow, Hydraulic properties.
Identifiers: *Chalk Aquifer, England, Delayed yield.

The groundwater hydraulics of the Chalk Aquifer in the Yorkshire Wolds were investigated in detail by a major hydrogeological pumping test and associated techniques in the Etton area and by the analysis of groundwater level and river flow data from the West Beck catchment. Nationally, the aquifer accounts for about 15% of all water supplies and current interest focuses on its potential for low-flow augmentation. Laboratory tests on core samples showed very low intergranular permeability and, therefore, flow was believed to be primarily through fissures. Early time-drawdown data from observation wells showed the effects of delayed yield. Analysis of late data gave transmissivity and specific yield values of about 1000 sq m/day and 0.005, respectively. Limited groundwater recession data in the West Beck catchment had a log-linear relationship similar to that of river flows. Considerable caution is required of preliminary investigations and extrapolation from pilot operations for river augmentation schemes. A high transmissivity, low specific yield, water-table aquifer will have a more rapid response than most unconfined systems. Actual

groundwater flow rates will also be relatively fast, a significant factor in the spread of pollutants, should they reach the water table. (Visocky-ISWS)
W75-10506

EVALUATION OF GROUND WATER RESOURCES: SACRAMENTO COUNTY,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 2F.
W75-10546

WATER FOR INDUSTRIAL DEVELOPMENT IN ALCORN, ITAWAMBA, PRENTISS, AND TISHOMINGO COUNTIES, MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 3E.
W75-10581

GROUND-WATER LEVELS IN NEW MEXICO, 1972,
Geological Survey, Albuquerque, N. Mex.
J. D. Hudson.
New Mexico State Engineer Basic Data Report, 1975. 72 p, 32 fig, 38 tab, 36 ref.

Descriptors: *Groundwater resources, *Water level fluctuations, *Basic data collections, *New Mexico, Observation wells, Aquifer characteristics, Pumping, Water utilization, Groundwater recharge, Maps, Hydrographs.

Water levels were measured in a network of about 1,600 observation wells in 35 areas located within nine major surface-water drainage basins in New Mexico. The measurements were made in January or February 1973 and reflect water-level changes with measurements made in January or February 1972. Maps showing well locations and water-level changes for 1972 are included for most areas. The water-level data are used in the U.S. Geological Survey and the State Engineer of New Mexico in evaluating the groundwater resources of the State. (Woodard-USGS)
W75-10582

HYDROGEOLOGY OF THE TRIASSIC ROCKS OF MARYLAND,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 2F.
W75-10584

HYDROLOGIC RECONNAISSANCE OF THE SOUTHERN UINTA BASIN, UTAH AND COLORADO,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 3B.
W75-10585

HYDROGEOLOGIC DATA FOR THE FARMINGTON RIVER BASIN, CONNECTICUT,
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 7C.
W75-10591

HYDROLOGICAL DATA FROM WELLS IN SOUTHWEST HILLSBOROUGH COUNTY, FLORIDA, 1950-74,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 7C.
W75-10593

MAP OF THE ANTELOPE VALLEY-EAST KERN WATER AGENCY AREA, CALIFORNIA, SHOWING GROUND-WATER SUBUNITS AND AREAS, LOCATION OF WELLS, AND WATER-LEVEL CONTOURS FOR SPRING 1974,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W75-10595

SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--RIO GRANDE REGION,
Geological Survey, Reston, Va.
S. W. West, and W. L. Broadhurst.
Available from Supt. of Documents, GPO, Washington, D.C. 20402 - Price $1.75. Professional Paper 813-D, 1975. 39 p, 21 fig, 2 tab, 154 ref.

Descriptors: Texas, New Mexico, Mexico, Colorado, *Groundwater resources, *Regional analysis, *Rio Grande River, Water supply, Water utilization, Aquifer characteristics, Water yield, Water quality, Withdrawal, Irrigation, Hydrologic data, Maps, Hydrographs, Appraisals, Economics, Evaluation, Water resources development, Surface-groundwater relationships, Watershed management, Legal aspects, Underground storage, Underground waste disposal.
Identifiers: *Rio Grande Region.

The Rio Grande is an interstate and international stream which begins in high mountains of Colorado, flows across New Mexico, and forms the boundary between Texas and Mexico. Annual precipitation on the region is about 86 million acre-feet; however, all but 4 million acre-feet is returned to the atmosphere by evapotranspiration. The groundwater reservoirs contain an aggregate of 5,800 million acre-feet of fresh and slightly saline water in storage, which could be withdrawn through wells. In contrast, the surface reservoirs have a combined storage capacity of only 18 million acre-feet. Withdrawal of groundwater in 1970 was 2.7 million acre-feet, of which 88% was used for irrigation. The region appears to offer several possibilities for utilizing underground space for purposes other than the withdrawal of water, such as waste disposal, artificial recharge, water-quality control, and development of geothermal energy. (Woodard-USGS)
W75-10597

SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--OHIO REGION,
Geological Survey, Reston, Va.
R. M. Bloyd, Jr.
Available from Supt. of Documents, GPO, Washington, D.C. 20402 - $1.75 (paper cover). Professional Paper 813-A, 1974. 41 p, 22 fig, 13 tab, 25 ref.

Descriptors: *Groundwater resources, *Regional analysis, *Ohio River, Water supply, Water utilization, Aquifer characteristics, Water yield, Water quality, Hydrologic data, Withdrawal, Groundwater recharge, Appraisals, Planning, Water resources development, Watershed management, Underground storage, Underground waste disposal.
Identifiers: *Ohio River Region.

Groundwater in the Ohio Region is a large, important, and manageable resource that should have a significant role in regional water development. On the basis of a comparison of groundwater withdrawals with estimated groundwater recharge, the groundwater resources probably will not be used at full potential under existing development plans. Annual groundwater use (1960) by municipalities and rural residents was about 1,000 million gallons per day. Average annual regional groundwater recharge is about 35,000 mgd. Therefore, base-year (1960) municipal and rural groundwater use is only about 3% of recharge. Annual regionwide groundwater use (1965) by industry also is only about 3% of recharge. Total potable groundwater available from storage in the outwash and alluvial aquifers in the Ohio River valley and the subbasins is about 23,000 billion gallons. This is about four times the flood-control storage of all Ohio Region Corps of Engineers reservoirs constructed, under construction, or in advance planning as of July 1965. Approximately 85,000 billion gallons of potable groundwater is available from storage in aquifers other than the outwash and alluvial aquifers. (Woodard-USGS)
W75-10598

A PREDICTIVE COMPUTER MODEL OF THE LOWER CRETACEOUS AQUIFER, FRANKLIN AREA, SOUTHEASTERN VIRGINIA,
Geological Survey, Richmond, Va.
For primary bibliographic entry see Field 2F.
W75-10599

WATER RESOURCES OF THE TOPPENISH CREEK BASIN, YAKIMA INDIAN RESERVATION, WASHINGTON.
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 3F.
W75-10603

GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1975,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 2F.
W75-10606

PROGRESS IN AUSTRALIAN HYDROLOGY 1965-1974.
For primary bibliographic entry see Field 2A.
W75-10646

SEEPAGE FROM RECHARGE AND LANDFILL DITCHES,
California Univ., Berkeley. Dept. of Geological Engineering.
For primary bibliographic entry see Field 5B.
W75-10770

GROUNDWATER CONTROL BY PUMPING,
Central Nebraska Public Power and Irrigation District, Holdrege.
J. A. Robertson, Jr, F. J. Dragoun, and D. W. Sall.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 179-194, 1974. 7 fig, 4 tab.

Descriptors: *Conjunctive use, *Irrigation, *Nebraska, Water resources development, Groundwater, Surface waters, Water management(Applied), Climatic data, Average, Land use, Crops, Water quality, Wells, Irrigation wells.

There are 116,700 acres being irrigated by surface water in the loessial uplands of the south central area of Nebraska between the Platte and Republican Rivers. After approximately 30 years of surface irrigation and a rising groundwater table, the trend appears to be toward a stable condition. This stable sub-surface condition exists through The Central Nebraska Public Power and Irrigation District's development of 270 groundwater wells and other improvements. The most consequential contribution to the present condition has been the expansion and development of more than 2400 private wells. Conjunctive use of water is essential for maximum benefit from both supplies, surface and sub-surface, but proper management of both supplies is also essential. The Central District, with the help of a consulting engineering firm, has developed a groundwater model to predict the effect of changes (such as canal lining and pipelines) in the surface water system on the groundwater resource. The one major problem remaining is development of an equitable revenue base for the surface water canal system that includes not only the surface water irrigators but also the groundwater irrigators receiving recharge benefits from the surface water canal system. (See also W75-10769) (Humphreys-ISWS)
W75-10778

CHANGE IN QUALITY OF PUMPED DRAINAGE EFFLUENT,
Bureau of Reclamation, Aurora, Colo.
For primary bibliographic entry see Field 5B.
W75-10779

DRAINAGE ANALYSIS OF A CONFINING FORMATION,
Agricultural Research Service, Mandan, N. Dak. Northern Great Plains Research Center.
For primary bibliographic entry see Field 4A.
W75-10780

GROUNDWATER MODEL AS A TOOL IN PLANNING AND MANAGEMENT,
CH2M/Hill, Portland, Oreg.
R. W. Charley, E. V. Lance, and G. M. Powell.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 251-272, 1974. 8 fig, 8 ref.

Descriptors: *Model studies, *Planning, *Management, *Groundwater, *Nebraska, Irrigation systems, Irrigation canals, Percolation, Seepage, Irrigation efficiency, Water table, Artesian aquifers, Transmissivity, Storage coefficient, Loess, Permeability, Peak loads, Safe yield, Crops, Costs, Soil moisture, Root zone, Evapotranspiration, Reservoir storage, Conjunctive use.
Identifiers: *Platte River(Neb), *Republican River(Neb).

The groundwater model is an excellent tool for planning the conjunctive use of ground and surface waters and for developing design criteria for irrigation system improvements. To construct and verify a model of a groundwater basin in south-central Nebraska, 10 years of groundwater, surface water, cropping pattern, and climatological data were used. The completed model simulated the movement of all groundwater within the basin and predicted groundwater elevations at nodal points for proposed changes to the irrigation system and projected changes in the cropping pattern. By use of the model, management can delineate problems and devise solutions making the best use of the resource available to them with confidence based on the responses of the simulation model. (See also W75-10769) (Visocky-ISWS)
W75-10781

WATER ANALYSIS OF RIVER WATERS IN KAGAWA (IX), CHEMICAL COMPOSITION OF THE AYA WATER BASIN, (IN JAPANESE),
For primary bibliographic entry see Field 2K.
W75-10841

GEOTHERMAL POWER PLANT WITH HIGH EFFICIENCY,
For primary bibliographic entry see Field 8C.
W75-10845

4C. Effects On Water Of Man's Non-Water Activities

SIMULATING TIMBER YIELDS AND HYDROLOGIC IMPACTS RESULTING FROM TIMBER HARVEST ON SUBALPINE WATERSHEDS,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 3B.
W75-10406

THE LOXAHATCHEE - A RIVER IN DISTRESS, SOUTHEAST FLORIDA,
Geological Survey, Miami, Fla.
H. G. Rodis.
Central and Southern Florida Flood Control District report, 1973. 9 p.

Descriptors: *Saline water intrusion, *Florida, *Streams, Environmental effects, Land clearing, Construction, Canals, Land development, Watershed management, Investigations, Surveys, Evaluation, Streamflow, Regulated flow, Groundwater levels, Water quality control, Pesticides, Nutrients, Path of pollutants, Water pollution sources.
Identifiers: *Loxahatchee River(Fla).

Before the turn of the century, the northwest fork of the Loxahatchee River in southeast Florida sustained a flow of fresh water to the sea and its narrow flood plain was covered by a dense river-forest of sub-tropical trees and plants. Today, with land development, digging of canals, and water control practices, salt water is encroaching upstream and has transformed the lower reach of this river into an arm of the sea. The upper reach too has changed, having practically disappeared into a maze of canals and ditches and a quiltwork of farms and homes. Only the middle reach now remains virtually unchanged. The middle reach of the Loxahatchee River is threatened with conversion to a brackish-water environment because diminishing fresh water flow is permitting salt water to move farther and farther upstream. The river requires a continuous flow of 50 cfs at the beginning of its middle reach to retard further upstream movement of the sea. This flow is valid only if groundwater inflow along the middle reach does not fall below 1971-73 levels. In addition to maintaining a minimum flow, the flow should be low in pesticides, nutrients, or other toxic materials. Otherwise, because of the deleterious effects of these substances on plant life, much of the benefit of salinity control will be mullified. (Woodard-USGS)
W75-10588

CHANNEL EROSION SURVEYS ALONG SOUTHERN SEGMENT OF THE TAPS ROUTE, ALASKA, 1972 AND 1973,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 8B.
W75-10594

HYDROLOGIC DATA FOR URBAN STUDIES IN THE FORT WORTH, TEXAS METROPOLITAN AREA, 1973,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C.
W75-10596

HYDROLOGY OF THE ALBEMARLE-PAMLICO REGION, NORTH CAROLINA--A PRELIMINARY REPORT ON THE IMPACT OF AGRICULTURAL DEVELOPMENTS,
Geological Survey, Raleigh, N.C.
R. C. Heath.
Available from NTIS, Springfield, Va 22161 as PB-243 642, $5.25 printed copy, $2.25 in microfiche. Water-Resources Investigations 9-75, May 1975. 98 p, 49 fig, 6 tab, 43 ref.

Descriptors: *Land clearing, *Agricultural engineering, *Swamps, *Drainage practices, Environmental effects, Overland flow, *North Carolina, Estuaries, Groundwater, Hydrology, Lakes, Geology, Water wells, Water level fluctuations, Land subsidence, Channeling, Farm management, Water quality, Oysters, Shrimp.
Identifiers: Albemarle Sound(NC), Pamlico River(NC), Dismal Swamp(NC), Yorktown Formation(NC), Castle Hayne Limestone(NC), Pungo River Formation(NC), Suffolk Scarp(NC).

Extensive agricultural land clearing and drainage operations are changing the hydrology in a 650 sq mi area of the Albemarle-Pamlico region in North Carolina. The affected area is part of the 1,634 sq mi peninsula that lies between Albemarle Sound on the north and Pamlico River on the south. The artificial drainage system being constructed will probably result in only a slight modification of the natural annual evapotranspiration, overland runoff, and groundwater discharge, but will likely result in several important problems. First, changes in the water quality of the sounds and estuaries resulting from the rapid runoff of storm waters may prove harmful to the fishery resources. Second, lowering of the water table may cause relatively rapid subsidence of the land surface in an irregular pattern in the extensive areas underlain by thick peat deposits as a result of biochemical oxidation, peat fires, and wind. (Woodard-USGS)
W75-10602

FLOOD WAVES AND SUSPENDED SEDIMENT PULSES IN URBANIZED CATCHMENTS,
University of New England, Armidale (Australia). Dept. of Geography.
I. Douglas.
Hydrology Symposium, Armidale, Australia, 1975. The Institution of Engineers, Australia, Preprints of Papers, p 61-64, May 1975. 4 fig, 13 ref.

Descriptors: *Flood discharge, *Urbanization, *Urban runoff, *Sediment load, *Storm runoff, Sediment discharge, Watersheds(Basins), Rainfall-runoff relationships, Tropical regions, *Australia, Graphical methods, Sediment transport.
Identifiers: Malaysia(Kuala Lumpur), New South Wales.

Analysis of storm event sediment transport using dimensionless sediment concentration graphs reveals contrasts between runoff and sediment yield from urban areas and that from adjacent rural lands. For a catchment in New South Wales (Australia) which is 15% urbanized, the contasts are marked for short-duration local storms, but not for major rainfall events. In the vicinity of Kuala Lumpur (Malaysia), a tropical area 40% urbanized, the contrast is so great that even in extreme events urban runoff and sediment yields are greater than those from rural areas. In estimating the hydrologic effects of urbanization, account must be taken of the original character of the ground surface and the proportion rendered impermeable by urbanization. (CSIRO)
W75-10647

WAIMANO STREAM FLOOD CONTROL PROJECT, PEARL CITY, HAWAII; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W75-10663

LAKE ERIE INTERNATIONAL JETPORT MODEL FEASIBILITY INVESTIGATION, PHYSICAL MODEL FEASIBILITY STUDY,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W75-10670

NEW SNOW FENCE DESIGN CONTROLS DRIFTS, IMPROVES VISIBILITY, REDUCES ROAD ICE,
Forest Service (USDA), Laramie, Wyo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2C.
W75-10693

THE EFFECTS OF URBANIZATION ON FLOODS OF DIFFERENT RECURRENCE INTERVAL,
University Coll., London (England). Dept. of Geography.
G. E. Hollis.
Water Resources Research, Vol 11, No 3, p 431-435, June, 1975. 3 fig, 1 tab, 20 ref.

Descriptors: *Floods, *Urbanization, *Urban runoff, *Runoff, Hydrology, Land use, Time of concentration, Surface runoff, Urban hydrology, Annual peak discharge, Peak discharge, Permeability, *Flood recurrence interval, Watersheds(Basins), Watershed management.

Urbanization does not affect floods of different recurrence intervals equally. Impervious cover such as roofs and roads prevents infiltration into the soil and speeds runoff. The effect is greatest in small floods which may be increased by a factor of 10 or more. L. B. Leopold (Hydrology for Urban Land Planning, 1968) has shown that urban-induced increases in peak discharges of annual floods can range from 1.5 up to 6 times the discharge of a similar undeveloped basin. But the effect diminishes as the size of the flood increases, since during prolonged rainstorms a rural watershed can become saturated and respond hydrologically as if it were an impervious urbanized area. Leopold's methodology is extended to derive a family of curves for the relationships between the increase in flood peaks following a given amount of urbanization, the percentage of the basin paved, and the flood recurrence interval. Data from 15 empirical studies were tabulated and graphed. The results show that paving less than 5% of the drainage area has negligible effect on floods with return intervals of 1 year or more; complete urbanization which results in at least 30% paving of the basin may double the discharge of the 100-year flood; and a flood with recurrence interval above 150 years is not materially affected by urbanization. (Herr-North Carolina)
W75-10709

RUNOFF OF OILS FROM RURAL ROADS TREATED TO SUPPRESS DUST,
Edison Water Quality Research Lab., N.J.
For primary bibliographic entry see Field 5B.
W75-10766

IMPACTS OF RURAL TO URBAN WATER USE,
Texas Office of the Governor, Austin. Water Task Force.
For primary bibliographic entry see Field 6D.
W75-10772

WATERSHED BEHAVIOR AFTER FOREST FIRE IN WASHINGTON,
Forest Service (USDA), Wenatchee, Wash. Forest Hydrology Lab.
J. D. Helvey.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Specialty Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 403-422, 1974. 6 fig, 4 tab, 16 ref, 1 append.

Descriptors: *Forest fires, *Watersheds(Basins), *Washington, Streamflow, Snowpacks, Precipitation(Atmospheric), Gaging stations, Soil moisture, Sedimentation, Temperature, Hydrographs, Evapotranspiration, Vegetation, Debris avalanches, Channel erosion, Geology, Road construction, Lumber, Lumbering.
Identifiers: *Entiat Experimental Forest(Wash), *Cascade Range, Shade reduction, Debris torrents.

More than 120,000 acres of forested land was burned over in north-central Washington in the summer of 1970. Included in the area was the Entiat Experimental Forest, where hydrologic measurements began in 1959. This area, located on the east slope of the Cascade Range, varies in elevation from 2000 to 7000 feet above sea level. Slope gradients average about 50%, but slopes over 90% are quite common. For the first time in this area, hydrologic data collected from forested watersheds in their natural condition could be compared with records collected after the vegetation was destroyed by fire. Hydrologic behavior in 1972 was in sharp contrast to pre-fire conditions, but was confounded by several factors. The effects of a single factor could not be determined. For example, the effect on runoff of reduced evapotranspiration caused by destruction of the vegetation by fire was confounded by abnormally high precipitation. Other complicating factors included logging road construction, logging over snow, and intense summer rainstorms. Studies are underway to monitor trends of vegetation development and to relate vegetation density to soil movement and water yield. In this way it is hoped to evaluate the effectiveness of various treatments on hydrologic behavior of these burned-over watersheds. (See also W75-10769) (Roberts-ISWS)
W75-10790

GROUNDWATER PROTECTION IN HIGHWAY CONSTRUCTION IN THE CATCHMENT AREA OF THE CITY OF BERNE AT KIESEN (GRUNDWASSERSCHUTZ BEIM AUTOBAHN IM FASSUNGSGEBIET STADT BERN IN KIESEN),
For primary bibliographic entry see Field 5C.
W75-10837

4D. Watershed Protection

SIMULATING TIMBER YIELDS AND HYDROLOGIC IMPACTS RESULTING FROM TIMBER HARVEST ON SUBALPINE WATERSHEDS,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 3B.
W75-10406

PEDOLOGIC COVER OF THE WATERSHED OF THE PORECKA RIVER,
Institute for Soil Research, Belgrade (Yugoslavia).
For primary bibliographic entry see Field 2A.
W75-10551

WATERSHED MANAGEMENT PROBLEMS AND OPPORTUNITIES FOR THE COLORADO FRONT RANGE PONDEROSA PINE ZONE: THE STATUS OF OUR KNOWLEDGE,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
H. L. Gary.
Research Paper RM-139, March 1975. 32 p, 24 fig, 4 tab, 70 ref.

Descriptors: Forest management, *Range management, Vegetation effects, *Ponderosa pine zone, *Watershed management, Conifers, Land use, Planning, Coniferous forests.

The east flank of the Continental Divide consists largely of open timber stands and grasslands. Soils erode easily after abuse. Precipitation ranges from 15 to 20 inches, about two-thirds from high-intensity storms from April to September. Guidelines are provided for maintaining satisfactory watershed conditions. The 3- to 5-inch water yields are comparatively small in contrast to yields of 12 to 25 inches from the high-altitude subalpine forests, but are important to development along the Front Range. Watershed management practices can be expected to provide practical alternatives for increasing water supplies. (Forest Service)
W75-10655

EVALUATION OF DISPOSAL AREAS IN JAMES RIVER; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W75-10669

ACTMO, AN AGRICULTURAL CHEMICAL TRANSPORT MODEL,
Agricultural Research Service, Chickasha, Okla.
For primary bibliographic entry see Field 5B.
W75-10846

TOTAL SEDIMENT LOAD BY THE EXTRAPOLATED DATA PROCEDURE,
Agricultural Research Service, Chickasha, Okla.
For primary bibliographic entry see Field 2J.
W75-10847

SEDIMENT-YIELD CHARACTERISTICS FROM UNIT SOURCE WATERSHEDS,
Agricultural Research Service, Chickasha, Okla.
For primary bibliographic entry see Field 2J.
W75-10848

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

ANALYTIC CHARACTERIZATION OF SEWER LOADING BY SPENT LIQUORS OF THE PULP INDUSTRY (ANALYTISCHE KENNZEICHUNG DER BELASTUNG DER VORFLUTER DURCH ABLAUGEN DER ZELLSTOFFINDUSTRIE),
For primary bibliographic entry see Field 5D.
W75-10381

DETERMINATION OF CADMIUM, COPPER, AND LEAD IN NATURAL WATERS AFTER ANION-EXCHANGE SEPARATION,
Vienna Univ., (Austria).
J. Korkisch, and A. Sorio.
Analytica Chimica Acta, Vol 76, No 2, p 393-399, June, 1975. 5 tab, 11 ref.

Descriptors: *Water analysis, *Cadmium, *Copper, *Pollutant identification, *Lead, *Anion exchange, Spectrophotometry, Chemical analysis, Analytical techniques, Separation techniques, Water chemistry, Water properties, Water quality, Water pollution sources, Pollutants, Resins, Metals, Inorganic compounds, Ion exchange, Foreign research, Foreign countries.
Identifiers: Dowex 1-X8 resin, Austria, Hydrobromic acid, Ascorbic acid, Nitric acid, Methanol.

A method is described for the determination of cadmium, copper, and lead in samples of natural non-saline waters. After acidification with hydrobromic acid, the water sample is filtered and, following the addition of ascorbic acid, passed through a column of the strongly basic anion-exchange resin Dowex 1-X8 (bromide form). On this exchanger cadmium (II), copper (I), and lead (II) are adsorbed as anionic bromide complexes. After elution of these elements with 1 molar nitric acid, the determinations by atomic absorption spectrometry are carried out in the medium consisting of 90% (volume basis) methanol and 10% 1.5 molar hydrobromic acid. The procedure was used for the routine determination of cadmium, copper, and lead in water samples collected in Austria. (Witt-IPC)
W75-10385

DETERMINATION OF MANGANESE IN NATURAL WATERS BY ATOMIC ABSORTION SPECTROMETRY WITH A CARBON TUBE ATOMIZER,
Kyoto Univ. (Japan).
T. Shigematsu, M. Matsui, O. Fujino, and K. Kinoshita.
Analytica Chimica Acta, Vol 76, No 2, p 329-336, June, 1975. 4 fig, 4 tab, 16 ref.

Descriptors: *Water analysis, *Pollutant identification, *Manganese, *Spectrophotometry, Chemical analysis, Analytical techniques, Water chemistry, Water properties, Water quality, Water pollution sources, Pollutants, Metals, Inorganic compounds.
Identifiers: Atomic absorption spectrometry.

The atomic absorption spectrometry of manganese was studied with carbon tube atomizers. Among various inner diameters of carbon tubes small bores gave higher sensitivity, but large bores gave higher reproducibility. A fairly linear calibration curve was obtained in the range of 1-6 times 10 to the minus 10th power g of manganese with injection volumes of 5 microliters. The detection limit was 1.5 times 10 to the minus 11th power g, and the relative standard deviation was 3.5%. In 40-fold amounts, few salts interfered, but there were considerable interferences from 400 and 4000-fold amounts. Manganese in natural waters was determined by extracting it into diisobutyl ketone as the diethyldithiocarbamate; the amounts found lay in the range 0.5-33 ppb. (Witt-IPC)
W75-10386

SPENT LIQUOR FROM PEROXIDE BLEACHING OF GROUNDWOOD PULP FROM SPRUCE,
Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Chemical Engineering.
O. Samuelson, and L.-A. Sjoberg.
Cellulose Chemistry and Technology, Vol 8, No 6, p 607-613, November/December, 1974. 14 fig, 3 tab.

Descriptors: *Bleaching wastes, Lignins, Alcohols, Organic compounds, Acids, Organic acids, Carbohydrates, Water pollution sources, Wastes, Industrial wastes, Pollutants, Waste water(Pollution), Pulp and paper industry, Organic acids, Organic wastes.
Identifiers: *Peroxide bleaching, *Groundwood pulp, *Spruce trees(Picea), Acetic acid, Hemicellulose, Pectins, Wood extractives, Methanol, Formic acid, Malonic acid, Tartronic acid, Malic acid.

Acetic acid was the most abundant organic compound in the spent bleach liquor, along with appreciable amounts of lignin, hemicelluloses, pectic substances, extractives, and methanol. Small amounts of monocarboxylic acids, especially formic acid, and of dicarboxylic acids, such as malonic, tartronic, and malic acids, were found as typical oxidation products of lignin and carbohydrates. (Ward-IPC)
W75-10392

DETERMINATION OF THE TRANSITION METALS MANGANESE, IRON, COBALT, COPPER AND ZINC IN RIVER FISHES WITH HELP OF X-RAY FLUORESCENCE ANALYSIS AND FLAMELESS ATOMIC ABSORPTION SPECTROSCOPY, (BESTIMMUNG DER UBERGANGSMETALLE MANGAN, EISEN, KOBALT, KUPFER UND ZINK IN FLUSSFISCHEN MIT HILFE DER RONTGENFLUORES-ZENZANALYSE UND DER FLAMMENLOSEN ATOMABSORPTION),
Bundesforschungsanstalt fuer Fischerei, Hamburg (West Germany). Isotopenlaboratorium.
U. Harms.
Archiv fur Fischerei Wissenschaft, Vol 25, No 1/2, p 63-74, September 1974. 4 fig, 1 tab, 18 ref.

Descriptors: *Analytical techniques, *X-ray fluorescence, *X-ray analysis, *Methodology, *Metals, *Spectroscopy, Iron, Copper, Zinc, Manganese, Cobalt, Fish, Absorption, Fluorescence, Pollutant identification.
Identifiers: *Bioaccumulation.

Fishes from the river Elbe were analyzed for manganese, iron, cobalt, copper and zinc using flameless atomic absorption spectroscopy and x-ray fluorescence. The analysis was based on a selective separation and enrichment of the metals by chelate exchanger chromatography. In element determinations, the metal traces were enriched by complex precipitation and transferred into an ideally measurable form. (Katz)
W75-10408

CORTICOSTEROID CONCENTRATIONS IN SOCKEYE SALMON (ONCORHYNCHUS NERKA) EXPOSED TO LOW CONCENTRATIONS OF COPPER,
Fisheries and Marine Service, Vancouver (British Columbia). Vancouver Lab.
For primary bibliographic entry see Field 5C.
W75-10415

X-RAY MICROANALYSIS OF ZINC AND IRON IN THE CHELORIDE CELLS OF MAYFLY LARVAE OF THE RIVER SULZ, (RONTGENMIKROANALYSE VON ZINK UND EISEN IN CHLORIDZELLEN VON EINTAGSFLIGENLARVEN AUS DER SULZ),
Landesanstalt fuer Gewasserkunde und Gewasserschutz Nordrhein-Westfalen, Krefeld (West Germany).
K. Heuss, and W. Wichard.
Oecologia, Vol 19, No 1, p 71-74, 1975. 1 fig, 1 tab, 3 ref. English abstract.

Descriptors: *Iron, *Zinc, *Mayflies, *Larvae, *Analytical techniques, *X-ray analysis, Aquatic insects, Bioindicators, Electron microscopy, Metals, Absorption, *Pollutant identification.
Identifiers: Bioaccumulation, *Chloride cells.

Chloride cells of mayfly larvae accumulate dissolved iron and zinc in correlation to different concentrations in the river Sulz. Energy-dispersive X-ray microanalysis with a scanning electron microscope was used for the analysis. (Katz)
W75-10416

MARINE POLLUTION BIOASSAY BY SEA URCHIN EGGS, AN ATTEMPT TO ENHANCE ACCURACY,
Doshisha Univ., Kyoto (Japan). Biological Lab.
N. Kobayashi.
Publications of the Seto Biological Laboratory, Vol 21, No 5/6, p 377-391, December 1974. 7 tab, 6 ref.

Descriptors: *Bioassay, *Bioindicators, *Water quality control, *Sea water, Aging(Biological), Fertilization, Embryonic growth stage, Pollutants, Water pollution effects, *Pollutant identification.
Identifiers: *Sea urchin eggs.

To improve the sensitivity of methods for marine pollution bioassay aged sea urchin eggs were utilized. The eggs were left in test water for some hours before they were inseminated; and then rates of fertilization, first cleavage, gastrulation and some anomalies in the test water were observed. Various abnormalities, i.e. the retarded formation of the fertilization membrane or the lack of one polyspermy, irregular cleavage and development, occurred more sensitively on aged eggs; and this seems to provide a better technique for bioassay of marine pollution. Hours to insemination should be limited within the range in which the eggs follow the normal development in ordinary, unpolluted sea water, since abnormalities occur in polluted water. They were 9 hours in Pseudocentroutus, 6 hours (warmed) in Hemicentrotus and 3 hours in Anthocidaris. The effects of heavy metals and other chemicals upon the aging of the eggs are not significant. (Katz)
W75-10419

HEAVY METAL CONTENTS OF FISHES CAUGHT IN KAOHSIUNG HARBOR, (IN CHINESE),
National Taiwan Univ., Taipei. Inst. of Oceanography.
S. S. Jeng, G. S. Wang, Y. W. Huang, and J. L. Lain.
Journal of the Fisheries Society of Taiwan, Vol 3, No 1, p 29-32, 1974. 1 fig, 1 tab, 4 ref. English abstract.

Descriptors: *Heavy metals, *Cadmium, *Copper, *Lead, *Mercury, *Nickel, *Zinc, *Water pollution effects, Shellfish, Fish, Tissue analysis, Environmental effects, Harbors.
Identifiers: *Kaohsiung Harbor(Taiwan), Republic of China.

Cadmium, copper, lead, mercury, nickel and zinc concentrations in fish and shellfish caught in Kaohsiung harbor in February, 1974 were studied. Cadmium, mercury, lead and zinc concentrations were around ordinary levels. However, the contents of copper and nickel in the fish and shellfish were higher than in those from other areas. This may indicate that the waters in Kauhsiung harbor were contaminated by copper and nickel discharged from the factories. (Katz)
W75-10430

BIOASSAY DATA FOR MARINE POLLUTION USING SEA URCHIN EGGS, 1972 AND 1973,
Doshisha Univ., Kyoto (Japan). Biological Lab.
N. Kobayashi.
Publications of the Seto Marine Biological Laboratory, Vol 21, No 5/6, p 411-432, December 1974. 17 tab.

Descriptors: *Bioassay, *Bioindicators, *Growth rate, *Inhibition, *Temperature, *Water quality control, Water pollution effects, Laboratory tests, Data collections, *Sea water, Pollutant identification.
Identifiers: *Sea urchin eggs, Hemicentrotus pulcherrimus, Anthocidaris crassispina, Japan.

The data accumulated from seventeen biological assay experiments are presented. Eggs of Hemicentrotus pulcherrimus and Anthocidaris crassispina were used to assay marine pollution during two years of experimentation. Water was from various sources and ranged in temperature from 13-28C. (Katz)
W75-10432

ANALYSIS OF TRI-ARYL PHOSPHATE ESTERS AND THE DETERMINATION OF IMOL S-140 IN FISH TISSUE AND WATER SAMPLES BY GAS CHROMATOGRAPHY,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
D. A. J. Murray.
Journal of the Fisheries Research Board of Canada, Vol 32, No 4, p 457-460, April 1975. 2 fig, 2 tab, 9 ref.

Descriptors: *Toxicity, *Organic compounds, *Gas chromatography, *Organophosphorus compounds, Oil, Analytical techniques, Chemical analysis, Water analysis, Sampling, Laboratory tests, *Pollutant identification, *Phenols, Lubricants.
Identifiers: Tissue analysis, *Imol.

A method is described for the analysis of tri-aryl phosphate esters used commercially as lubricants. In a fish toxicity study, Imol S-140 (tri-tolyl phosphate) was extracted from fish tissue and water samples, hydrolyzed, and the individual phenols measured by gas chromatography as the

trimethylsilyl derivatives. The lower detection limit was about 3 ppm of Imol in wet fish tissue. (Katz)
W75-10442

MULTICHANNEL TOXICANT INJECTION SYSTEM FOR FLOW-THROUGH BIOASSAYS,
National Water Quality Lab., Duluth, Minn.
D. L. DeFoe.
Journal of the Fisheries Research Board of Canada, Vol 32, No 4, p 544-546, April 1975. 1 fig, 2 ref.

Descriptors: *Design, *Bioassay, Construction equipment, Costs, Instrumentation, *Measurement.
Identifiers: *Flow-through bioassays, *Water-metering cells, Falling water.

A mechanical injection system needing little maintenance is described which offers a dependable and flexible method for maintaining multiple toxicant concentrations in flow-through bioassays. Falling water from a series of water metering cells similar to those of a proportional diluter, activates a series of mechanical syringe injectors. The system dispenses equal amounts of toxicant dispersants (solvents, wetting agents or additives) to all toxicant concentrations and to a dispersant control and allows changing unlimited toxicant concentrations independently of each other. (Katz)
W75-10443

RESIDUES OF POLYCHLORINATED BIPHENYLS (PCB) AND CHLORINATED PESTICIDES IN FISH AND BIRDS OF THE PO DELTA, (RESIDUS DE POLYCHLOROBIPHENYLS (PCB) ET DE PESTICIDES CHLORES DANS LES POISSONS ET LES OISEAUX DU DELTA DU PO),
Bologna Univ. (Italy). Istituto di Biochimica.
For primary bibliographic entry see Field 5B.
W75-10446

ELECTRON MICROSCOPE AUTORADIOGRAPHY OF KIDNEY AFTER ADMINISTRATION OF PB-210 IN MICE,
Tokyo Univ. (Japan). Dept. of Public Health.
M. Murakami, and K. Hirosawa.
Nature, Vol 245, No 5421, p 153-154, September 21, 1973, 1 fig, 8 ref.

Descriptors: *Lead, *Rodents, *Cylological studies, Distribution, *Radioisotopes, Animal physiology, Analytical techniques, Microscopy, Electron microscopy, *Pollutant identification, Metals.

The precise localization of PB 210 in some organelles in the tubular epithelial cells of the mouse kidney was demonstrated by the use of electron microscopic autoradiography. Male mice were injected intraperitoneally with 0.5 ml of solution of RaD in 0.1% acetic acid and killed 30 minutes after injection. RaD contains PB 210, Bi 210, and Po 218 in radioactive equilibrium. Alpha-emission of Pb 210 results in the appearance of silver grains in the emulsion. Counting the grains on 20 tubules showed that in the epithelial cells, more than half of the grains were found on mitochondria and about one third on the cytoplasm, half of which were associated with cytoplasmic membranes. A few grains were found on the nuclei of the epithelial cells. The results indicated that lead is accumulated in the mitochondria and in the cytoplasm as soon as 30 minutes after its administration. Grains were found on the various kinds of membrane and on the cytoplasm free of membranes. Thus, the cytoplasm as well as the membranes seem to be involved in the incorporation and transport of lead. (Jernigan-Vanderbilt)
W75-10476

AVERAGE TRACE ELEMENT COMPOSITION OF LOW LEVEL MARINE ATMOSPHERIC PARTICULATES,
Liverpool Univ. (England). Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W75-10477

PERSISTENCE OF CADMIUM-INDUCED METABOLIC CHANGES IN LIVER AND KIDNEY,
Ottawa Univ. (Ontario). Dept. of Pharmacology.
R. L. Singhal, Z. Merali, S. Kacew, and D. J. B. Sutherland.
Science, Vol 183, No 4129, p 1094-1096, March 15, 1974. 2 tab, 15 ref.

Descriptors: *Cadmium, *Rodents, *Metabolism, Animal physiology, Laboratory tests, Toxicity, Protein, *Biochemistry, Cytological studies, *Pollutant identification.

Daily intraperitoneal injection of cadmium chloride (1 milligram per kilogram) for 45 days enhanced gluconeogenesis as evidenced by significant increases in the activities of liver and kidney cortex pyruvate carboxylase, phosphopyruvate carboxylase, hexosediphosphatase, and glucose-6-phosphatase, the quartet of key, rate-limiting enzymes involved in the biotransformation of non-carbohydrate precursors into glucose. Whereas cadmium treatment decreased the level of hepatic glycogen, the concentration of blood glucose and urea was significantly elevated by this heavy metal. Discontunation of the heavy metal treatment for 28 days, in rats previously injected with cadmium for 45 days, failed to restore the observed biochemical alterations in hepatic and renal carbohydrate metabolism to control values. Evidence indicates that cadmium augments the glucose-synthesizing capacity of liver and kidney cortex and that various metabolic changes persist even after a 4-week period of withdrawal from exposure to the heavy metal. (Jernigan-Vanderbilt)
W75-10478

TOXIC TRACE ELEMENTS: PREFERENTIAL CONCENTRATION IN RESPIRABLE PARTICLES,
Illinois Univ., Urbana. School of Chemical Sciences.
D. F. S. Natusch, J. R. Wallace, and C. A. Evans, Jr.
Science, Vol 183, No 4121, p 202-204, January, 1974. 1 fig, 2 tab, 13 ref. NSF (GI 31605) and (GH 33634).

Descriptors: *Trace elements, *Toxicity, *Industrial wastes, *Fossil fuels, *Air pollution, Cadmium, Lead, Laboratory tests, Analytical techniques, Spectroscopy, Arsenic compounds, Pollutant identification, Path of pollutants.

This study was designed to test the theory that combustion characteristics at the particle source determines why many toxic elements are most concentrated in the smallest ambient airborne sources. The tests were conducted in reference to fly ash derived from coal-fired power plants. The elements arsenic, antimony, cadmium, lead selenium and thallium were most concentrated in the smallest respirable particles emitted from coal-fired power plants. It was concluded that these elements, or their compounds are probably volatilized during combustion and preferentially absorb or condense onto the small particles which can most easily pass through conventional control equipment. (Jernigan-Vanderbilt)
W75-10482

LEAD METABOLISM IN THE NORMAL HUMAN: STABLE ISOTOPE STUDIES,
California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
M. B. Rabinowitz, G. W. Wetherill, and J. D. Kopple.
Science, Vol 182, p 725-727, November 16, 1973. 2 fig, 9 ref. NSF-GI-38339.

Descriptors: *Human population, *Metabolism, *Lead, *Stable isotopes, Isotope studies, Distribution, Kinetics, Diets, Mass spectrometry, Equations, Pollutant identification.

The effects of lead intake on a healthy, 53-year old, white male weighing 70 kilogram were studied. A low lead diet of 2500 kcal/day with abundant proteins, vitamins and minerals was administered for 160 days. During the first 104 days, each meal was supplemented with Pb204 nitrate to increase the total dietary lead intake to 367 micrograms. For the next 10 days, the subject received Pb207 nitrate. For the remaining time, the subject received only the low lead diet. The concentration and isotopic composition of lead was determined serially in the diet, blood, urine, facial hair, and atmosphere by mass spectrometric isotope dilution analysis. The kinematics and distribution of lead in the body were, analyzed in terms of a three compartment model: compartment one was blood, compartment two was soft tissue, and compartment three was the skeleton. Results showed that 2/3 of assimilated lead was dietary in origin and that the remainder was inhaled. (Rowe-Vanderbilt)
W75-10484

THE DETERMINATION OF MERCURY IN SOILS AND RELATED MATERIALS BY COLD-VAPOUR ATOMIC ABSORPTION SPECTROMETRY,
Macaulay Inst. for Soil Research, Aberdeen (Scotland).
A. M. Ure, and C. A. Shand.
Analytica Chimica Acta, Vol 72, No 1, p 63-77, September, 1974. 4 fig, 6 tab, 48 ref.

Descriptors: *Spectrophotometry, *Analytical techniques, *Mercury, *Soil analysis, Peat, Organic matter, Soils, Heavy metals, Soil chemistry, Testing procedures, *Pollutant identification.
Identifiers: *Atomic absorption spectrometry.

Since no authenticated soil reference samples for mercury analysis were available, an evaluation of a new circulation apparatus for atomic absorption was performed with three sample preparation methods using natural samples. One of the methods involved digestion and wet oxidation, which employed a nitric and sulfuric acid mixture for digestion followed by potassium permanganate oxidation. The second method, which could readily be adapted for the collection and determination of Hg in air or other gases, involved acid digestion, wet oxidation, and collection in potassium permanganate. The third method - oxygen flask combustion - involved burning a pelleted sample in a perforated tantalum basket in an oxygen-filled flask containing a collecting solution to absorb the Hg evolved. In the analysis, the usual bubbling technique for Hg removal from the sample solution was replaced by a procedure in which the mercury in the reduced sample was partitioned between a fixed volume of air and the liquid phase in a closed vessel by agitation. The air was then blown through an absorption cell for measurement. Absorption peak-heights were some 30-40% greater than those obtained with a bubbling system without recirculation. For 1g samples, the analytical range was 0.01-0.5 ppm. (Pulliam-Vanderbilt)
W75-10485

ATOMIC-ABSORPTION SPECTROMETRIC DETERMINATION OF COPPER, LEAD, CADMIUM AND MANGANESE IN PULP AND PAPER BY THE DIRECT-ATOMIZATION TECHNIQUE,
Oslo Univ. (Norway). Dept. of Chemistry.
F. J. Langmyhr, Y. Thomassen, and A. Massoumi.
Analytica Chimica Acta, Vol 68, No 2, p 305-309, February, 1974, 1 fig, 2 tab, 3 ref.

Descriptors: *Heavy metals, *Analytical techniques, Spectroscopy, Copper, Lead, Cadmium, Manganese, Equipment, Sampling, Testing procedures, *Pollutant identification.
Identifiers: *Atomic absorption spectroscopy.

The direct-atomization technique of atomic absorption spectrometry was applied to the determination of copper, lead, cadmium and manganese in a sample of pulp and four types of paper. Samples of 1-20 mg were ashed and atomized in a graphite furnace, the determinations being based on the standard addition technique. The method was simple, rapid and sensitive and no reagents were added to the samples. (Jernigan-Vanderbilt)
W75-10489

NBS ADDS FOREIGN WRINKLE TO STANDARDS WORK,
J. R. Long.
Chemical and Engineering News, Vol 51, No 31, p 12-14, July 30, 1973.

Descriptors: Standards, *Materials testing, Control, *Metals, Analytical techniques, Governments, Specifications, Investigations, Pollutants, Toxicity, Public health, *Pollutant identification, Trace elements, Water quality standards.
Identifiers: *Standard reference materials.

Due to the international concern for standard reference materials (SRM's) applicable to areas such as health, pollution control, and resource development, the National Bureau of Standards has added participation by foreign scientists to its studies. Japan's effort is the largest, but there is also some work in Pakistan and Yugoslavia. The hope was advanced that in time some of the foreign scientists will develop new techniques to analyze for exotic trace elements. For a certificate to be issued, the concentration of each element certified must be determined either by two or more completely different analytical techniques or by two or more separate laboratories using the same technique. At the time, certification studies on biological materials were concentrating on 12 elements that were either known or suspected to be toxic or have known physiological functions. The NBS had recently extended the trace element SRM program into the area of energy and pollution. If legal limits to the amounts of trace elements are set and techniques for measuring them accurately are not available, then the law can neither be enforced nor upheld without excessive dispute or litigation. (Pulliam-Vanderbilt)
W75-10490

ATOMIC ABSORPTION SPECTROMETRIC DETERMINATION OF CADMIUM, LEAD, SILVER, THALLIUM AND ZINC IN SILICATE ROCKS BY DIRECT ATOMIZATION FROM THE SOLID STATE,
Oslo Univ. (Norway). Dept. of Chemistry.
For primary bibliographic entry see Field 2K.
W75-10492

DETERMINATION OF NICKEL IN ROCKS AFTER EPITHERMAL NEUTRON ACTIVATION,
Institutt for Atomenergi, Kjeller (Norway). Isotope Labs.
For primary bibliographic entry see Field 2K.
W75-10493

URANIUM, THORIUM, AND LEAD CONCENTRATIONS IN THREE SILICATE STANDARDS AND A METHOD OF LEAD ISOTOPIC ANALYSIS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 2K.
W75-10494

EFFECT OF DIETARY SELENIUM ON GLUTATHIONE PEROXIDASE IN THE CHICK,
California Univ., Davis. Dept. of Food Science and Technology.
S. T. Omaye, and A. L. Tappel.
Journal of Nutrition, Vol 104, No 6, p 747-753, June 1974. 3 fig, 3 tab, 20 ref.

Descriptors: *Toxins, *Lipids, Path of pollutants, *Animal metabolism, *Animal pathology, Environmental effects, Metals, *Pollutant identification, Water pollution effects.
Identifiers: *Selenium.

Tissues of chicks fed a diet deficient in selenium demonstrated decreased glutathione (GSH) peroxidase activity. GSH peroxidase activity was dose-related to the level of selenium; the specific activity increased as a logarithmic function of the dietary selenium level. Essentially, there was no difference between the activity of GSH peroxidase in various tissue soluble fractions from chicks fed equal gram-atoms of selenium as sodium selenite and as selenomethionine. Regression analysis of pooled data for GSH peroxidase and GSH reductase activities in tissues of chicks fed 0.1 ppm selenium indicated a linear relationship between the two enzymes. These data supported the hypothesis that GSH peroxidase and GSH reductase are metabolically related. GSH reductase activity was not related to dietary selenium levels. The implications of this study were that GSH peroxidase is dependent upon selenium for activity and that it also is a part of a detoxification system for peroxides. (Pulliam-Vanderbilt)
W75-10495

FAST SEPARATION OF TIN (IV) FROM TIN (II) AND FROM NUMEROUS METAL IONS ON ION-EXCHANGE PAPERS,
Tabriz Univ. (Iran). Analytical Lab.
For primary bibliographic entry see Field 2K.
W75-10497

SPECTROSCOPIC DETERMINATION OF ATOMIZATION EFFICIENCY (CUCL-CU+CL) IN AN AIR-HYDROGEN FLAME,
Nagoya Univ. (Japan). Dept. of Synthetic Chemistry.
For primary bibliographic entry see Field 2K.
W75-10498

RAPID EXTRACTIVE SPECTROPHOTOMETRIC DETERMINATION OF GOLD (III) WITH 4-(2-PYRIDYLAZO)- RESORCINOL,
Indian Inst. of Tech., Bombay. Dept. of Chemistry.
For primary bibliographic entry see Field 2K.
W75-10499

REMOVAL OF TRACE METALS DURING CONVENTIONAL WATER TREATMENT,
For primary bibliographic entry see Field 5F.
W75-10501

ENRICHMENT OF SURFACE FRESHWATER MICROLAYERS WITH ALGAE,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
B. C. Parker, and R. F. Hatcher.
Journal of Phycology, Vol 10, No 2, p 185-189, 1974.

Descriptors: *Algae, Eutrophication, Water pollution effects, *Sampling, Biological communities, *Pollutant identification.

Using a variety of techniques for sampling microlayers in freshwater environments, the frequent occurrence of significant and striking differences in algal community structure and densities relative to subsurface water is demonstrated.--Copyright 1974, Biological Abstracts, Inc.
W75-10583

INDEX TO WATER RESOURCES DATA FOR LOUISIANA: SURFACE WATER RECORDS; WATER-QUALITY RECORDS.
Geological Survey, Baton Rouge, La.
Louisiana Department of Public Works, Baton Rouge, Water Resources Basic Records Report No 8, 1975. 81 p, 2 tab.

Descriptors: Indexing, *Streamflow, *Water quality, *Louisiana, *Stations, Information retrieval, *Data collections, Hydrologic data, Sites, Drainage area, Cooperatives, Pollutant identification.
Identifiers: *Water resources index(La), Period of record collections.

This index is a tabulation of all sites at which streamflow or water-quality data have been collected in Louisiana by the U.S. Geological Survey through December 31, 1974. Table 1 is an alphabetical listing of all streamflow and water-quality stations, and table 2 is a downstream order listing of stations. Both listings include the same data in 6 columns: (1) Station name and location used for reference purposes; (2) type of records available at the site; (3) drainage area in square miles; (4) the elevation, in feet above mean sea level, of the zero of the gage; (5) the agency that furnished financial cooperation in the operation of the station; and (6) the dates, month and year, for which records are available. (Woodard-USGS)
W75-10590

A RIVER-QUALITY ASSESSMENT OF THE UPPER WHITE RIVER, INDIANA,
Geological Survey, Indianapolis, Ind.
For primary bibliographic entry see Field 5B.
W75-10600

TEMPERATURES OF WYOMING STREAMS,
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 7C.
W75-10604

STUDIES ON THE METABOLISM OF CHLOROPHENOLS IN FISH-III ISOLATION AND IDENTIFICATION OF A CONJUGATED PCP EXCRETED BY GOLDFISH,
Hyogo Prefecture Fisheries Experiment Station, Kobe (Japan).
H. Akitake, and K. Kobayashi.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 41, No 3, p 321-327, March 1975. 4 fig, 1 tab, 15 ref.

Descriptors: *Organic compounds, *Freshwater fish, Analytic techniques, *Biochemistry, Laboratory tests, Methodology, *Phenols, *Pollutant identification, Water pollution effects.
Identifiers: *Goldfish, Carassius auratus, *PCP, Excretion, Phenolic compounds, Chemical breakdown, Conjugation, Detoxification mechanism.

The amount of phenolic compounds (PCP) in goldfish, Carassius auratus, was less than that lost from the PCP-medium during culture. Most of the PCP excreted was in a conjugated form, pentachlorophenyl-sulfate, accompanied with a small free-form amount. The study suggested that fish possess a detoxification mechanism for chlorophenols which involves sulfate conjugation. (See also W70-08375 and W70-08379) (Katz)
W75-10611

RESIDUE ANALYSES ON 2-AMINO-4 PHENYLTHIAZOLE, A PISCINE ANESTHETIC, IN FISHES-I A MODEL RADIO-TRACER EXPERIMENT WITH MEDAKA,
Meiji Seiki Kaisha Ltd., Yokohama (Japan). Research Labs.
Y. Sekizawa, K. Umemura, M. Shimura, A. Suzuki, and T. Kikuchi.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 41, No 4, p 449-458, April 1975. 4 fig, 2 tab, 12 ref.

Descriptors: *Killifishes, Laboratory experiments, Organic compounds, *Tracers, Fish physiology, *Absorption, Metabolism, Analytical techniques, Chromatography, Aquaculture, Equations, *Pesicide residues, Radioactivity techniques, Analytical techniques, *Pollutant identification.
Identifiers: *Medaka, *Anesthetic(Piscine), Residue analysis, 2-Amino-4-phenylthiazole, Excretion, Bioaccumulation.

Residue analyses on 3H-2-amino-4-phenylthiazole were performed in medaka (killifish, Oryzias latipes). This fish was selected because of its ready application in radiotracer experiments and its marked and unique ability to detoxify the piscine anesthetic, 2-amino-4-phenylthiazole to its N-hexuronyl conjugate. The absorption/excretion balance showed an average 102% recovery indicating that the excretion treatment effectively exhausted the residue from medaka. The half-life for retention of this compound and its N-hexuronyl conjugate in the fish body was approximately 12-15 hours. The fates of both the anesthetic and its N-hexuronyl conjugate in the fish body were determined separately in a time course survey using TLC radiography. Plots for the excretion of the major product, i.e. the conjugate, and the anesthetic per se produced two crossing exponential curves suggesting that there are two compartmentations of both the conjugate and the anesthetic per se in medaka. A mathematical simulation of the residue was also described. (Katz)
W75-10614

DEVICES FOR TOXICOLOGICAL LONG-TERM STUDIES ON AQUATIC ORGANISMS (GERATE ZUR DURCHFUHRUNG TOX-IKOLOGISCHER LANGZEITSTUDIEN AN WASSERORGANISMEN),
Farbwerke Hoechst, Frankfurt am Main (West Germany).
N. Knauf.
Archiv fur Fischerei Wissenschaft, Vol 26, No 3, p 103-108, April 1975. 2 fig, 13 ref.

Descriptors: Aquatic animals, Design, *Laboratory tests, Construction, *Flow, Toxicity, Water pollution effects, Pollutant identification, Analytical techniques.
Identifiers: Dynamic tests, Flow-through studies, Residue studies.

For the performance of dynamic tests with water organisms two different types of flow-through apparatus were described as were experiences in running the devices. They were built from ordinary laboratory materials; the basic principle was uncomplicated; the tests were safe. They can be used for experiments with chronic toxicity of threshold concentrations and for residue studies. (Katz)
W75-10618

PCBS IN THE SPOTTED SHARKS, MUSTELUS MANAZO, FROM TOKYO BAY, (IN JAPANESE),
Tokai Regional Fisheries Research Lab., Tokyo (Japan).
H. Shimma, and Y. Shimma.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 40, No 11, p 1179-1186, November 1974. 2 fig, 4 tab, 11 ref.

Descriptors: *Polychlorinated biphenyls, *Sharks, *Saline water fish, *Growth stages, *Bioassay, *Lipids, Fish physiology, Organic compounds, Pollutant identification, Water pollution effects.
Identifiers: *Spotted sharks, Mustelus manazo, Bioaccumulation, *Tokyo Bay, Liver, Flesh, Yolk lipid, Biosynthesis, *Japan.

Lipids were extracted successively with 2:1 mixture of n-hexane and chloroform-methanol from flesh, liver and other viscera of 7 spotted sharks, Mustelus manazo taken from Tokyo Bay. One shark contained embryos. The contents and composition patterns of chlorobiphenyls were examined. Among immature fish, a linear relationship between body weight and PCB content was observed. PCBs found in the liver consisted mainly of hexa- and hepta-chlorinated compounds. In parent fish, the PCB content in flesh tended to increase, possibly with age. In embryos, the PCB content of yolk lipid was twice that of body lipid and similar to the Chloroform-methanol extracted lipid from parent fish liver. (Katz)
W75-10622

INFLUENCE OF A THERMAL EFFLUENT ON MOVEMENT OF BROWN BULLHEAD (ICTALURUS NEBULOSUS) AS DETERMINED BY ULTRASONIC TRACKING,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W75-10628

THE EFFECT OF CERTAIN ORGANIC POLLUTANTS ON COPPER TOXICITY TO FISH (LEBISTES RETICULATUS),
Michigan Univ., Ann Arbor.
For primary bibliographic entry see Field 5C.
W75-10637

TRACE ELEMENTS IN MELBOURNE RIVERS - AN INTERLABORATORY ANALYSIS,
Materials Research Labs., Melbourne (Australia).
A. T. Phillip, R. W. Pettis, J. E. Harris, G. J. Fabris, and P. L. Boar.
Proceedings of the Royal Australian Chemical Institute, Vol 42, No 8, p 209-215, August 1975. 1 fig, 5 tab, 31 ref.

Descriptors: *Water analysis, *Heavy metals, *Water pollution, *Rivers, *Australia, Analytical techniques, *Trace elements, Chemical analysis, Copper, Cadmium, Lead, Toxicity, Aquatic life.
Identifiers: Melbourne(Vic), Yarra River, Maribyrnong River.

A survey of levels of copper, lead and cadmium in the Yarra and Maribyrnong Rivers (Victoria, Australia) was undertaken cooperatively by three independent laboratories, each with expertise in the analysis of trace elements in water. The overall mean values obtained indicate that the metals occur at levels not expected to produce toxic effects on any but the most sensitive of aquatic organisms. Variations in results obtained by the three laboratories are reported and discussed, with recommendations for standard procedures and precautions. (CSIRO)
W75-10649

BIOLOGICAL BASES FOR WATER QUALITY STANDARDS,
Rice Univ., Houston, Tex. Dept. of Biology.
For primary bibliographic entry see Field 5G.
W75-10677

ANALYSIS OF POLLUTION FROM MARINE ENGINES - STATUS REPORT,
Environmental Control Technology Corp., Ann Arbor, Mich.
J. E. Schenk, P. G. Meier, and M. E. Bender.
In: Proceedings of the 27th Industrial Waste Conference, May 2-4, 1972, Purdue University, Lafayette, Indiana, Engineering Extension Series No 141; Part 2, p 926-938. 16 fig, 1 tab, 7 ref. EPA 15020 GPG.

Descriptors: *Boating, *Water pollution effects, Recreation, Gasoline, Lead, Water pollution sources, *Florida, Lakes, *Pollutant identification.
Identifiers: *Motor boats, Outboard engines.

The first year report of a two-year study into the effect of outboard engine stress on natural, freshwater systems describes the investigative approach, preliminary results, and research projections for the subsequent year. Two lakes near Archer, Florida allowed simultaneous testing of both engines equipped with crankcase drainage systems and drainless engines. The northern study, conducted near Saline, Michigan, used only engines of the drainless type and leaded versus non-leaded gasoline. The discussion centers on the northern study, differentiated by the fact that it undergoes a rest period during ice cover, while the southern investigation operates all year. The amount of outboard motor stress that a particular body of water might be exposed to was approached from the viewpoint of the number of boats that reasonably could be expected to occupy a given water surface area and investigation of existing data on the effects of outboard emissions where stress levels are indicated for fish tainting, reproductive success, and acute toxicity. Lead analysis showed only slight increases in the water and sediments; however, an apparent threefold increase in lead concentration was noted in plant material. The first year results substantiated no definite conclusions on the effects of outboard engines on an aquatic ecosystem. (Auen-Wisconsin)
W75-10688

AUTOMATED SEQUENTIAL COMPOSITE SAMPLING. A NEW TECHNIQUE FOR WATER POLLUTION STUDY AND CONTROL,
N-Con Systems Co., Inc., Larchmont, N.Y.
M. I. Beach, and J. S. Beach.
In: Proceedings of the 27th Industrial Waste Conference, May 2-4, 1972, Purdue University, Lafayette, Indiana, Engineering Extension Series No 141, Part 2, p 1084-1088. 1 fig.

Descriptors: *Analytical techniques, *Waste identification, *Industrial wastes, Liquid wastes, Sampling, Automation, *Pollutant identification, Pollution abatement, Water pollution control.

The new type sampler described, combines the best features of grab and composite samplers and is a valuable technique for evaluating industrial wastes and storm flows because it provides hour-by-hour profiles of waste conditions which can be correlated with production schedules or specific events. All 24 samples are available for specific analysis if it is necessary. Simple or flow-proportioned composites for any desired period can be made to suit the needs or goals of a water quality control program. Sequential composites isolate possible self-cancelling factors such as pH, acidity and alkalinity, or color variations, as well as significant factors which would be lost by dilution in a 24-hour composite or missed in a single grab sample. Analysis of the individual sequential composites can aid in determining the effect of upsets of spills as well as establishing when they occurred and how long they lasted. Data acquired from analysis can also be useful in determining whether a particular condition is the result of a single incident or continual small discharges. The sequential composite is made up of a series of frequently collected samples composited and retained in individual containers each of which represents a sub-period within the overall sampling period. (Auen-Wisconsin)
W75-10690

TOXICITY OF THE LAMPRICIDE 3-TRIFLUOROMETHYL-4-NITROPHENOL (TFM) TO THE NONTARGET FISH IN STATIC TESTS,
Bureau of Sport Fisheries and Wildlife, LaCrosse, Wis. Fish Control Lab.
For primary bibliographic entry see Field 5C.
W75-10701

TOXICITY OF THE LAMPRICIDE 3-TRIFLUOROMETHYL-4-NITROPHENOL

(TFM) TO NONTARGET FISH IN FLOW-THROUGH TESTS,
Bureau of Sport Fisheries and Wildlife, LaCrosse, Wis. Fish Control Lab.
For primary bibliographic entry see Field 5C.
W75-10702

TOXICITY OF THE LAMPRICIDE 3-TRIFLUOROMETHYL-4-NITROPHENOL (TFM) TO SELECTED AQUATIC INVERTEBRATES AND FROG LARVAE,
Bureau of Sport Fisheries and Wildlife, Warm Springs, Ga. Southeastern Fish Control Lab.
For primary bibliographic entry see Field 5C.
W75-10703

FIVE YEAR STUDY OF DES MOINES RIVER WATER QUALITY,
Iowa State Univ., Ames. Engineering Research Inst.
For primary bibliographic entry see Field 5B.
W75-10803

A REMOTE SENSING LASER FLUOROMETER,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
R. A. O'Neil, A. R. Davis, H. G. Gross, and J. Kruus.
Laser and Unconventional Optics Journal, No 52, p 3-44, May, 1974. 26 fig, 7 ref.

Descriptors: *Lasers, *Remote sensing, *Fluorometry, Analytical techniques, Sampling, *Oil spills, *Pollutant identification, Instrumentation streams, Chemical wastes, Monitoring, Oil pollution.
Identifiers: Fluormeters.

A remote sensing laser fluorometer has been constructed to observe organic and biological materials in water. By remote sensing, larger areas may be observed than by point sampling techniques. An airborne fluorosensor, as developed by the Department of the Environment (Canada), was to be used solely for detecting oil spills. It has now been applied to detecting chlorophyll, dye and other industrial chemical wastes. Although the fluorometric device cannot make unambiguous identification of oil types, the instrumentation has wide application in monitoring naturally occurring waters for pollutants. When used in combination with stream gauging stations or automatic sampling units, a remote sensing laser fluorometer could provide useful data on the temporal characteristics of the water flowing past the sensor. Further uses include making remote reflectance measurements, although it would be limited to a single wavelength. (Prague-FIRL)
W75-10831

SENSITIVITY OF HUMAN DIPLOID EMBRYONIC LUNG CELLS FROM ISOLATION OF ECHO VIRUSES FROM SEWAGE,
Ustav Hygieny, Prague (Czechoslovakia).
For primary bibliographic entry see Field 5C.
W75-10836

WATER ANALYSIS OF RIVER WATERS IN KAGAWA (IX), CHEMICAL COMPOSITION OF THE AYA WATER BASIN, (IN JAPANESE),
For primary bibliographic entry see Field 2K.
W75-10841

THE TOXICITY OF HEAVY METAL IONS TO ANAEROBIC DIGESTION,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 5D.
W75-10843

A GRAVITY-FLOW COLUMN TO PROVIDE PESTICIDE-LADEN WATER FOR AQUATIC BIOASSAYS,
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Environmental Research Lab.
P. W. Borthwick, M. E. Tagatz, and J. Forester.
Bulletin of Environmental Contamination and Toxicology, Vol 13, No 6, p 183-187, February 1975. 1 fig, 3 tab, 5 ref.

Descriptors: *Pesticides, *Bioassay, *Laboratory tests, Technology, *Design, Chlorinated hydrocarbon pesticides, Methodology, Solvents, Carriers, Solubility, Pollutant identification.
Identifiers: *Mirex, *Gravity-flow column.

A column containing granular pesticide, bait, or inert material coated with pesticide achieves realistic concentrations of pesticides in bioassay water without using carrier solvents that may affect results. Mirex was introduced into flow-through aquatic bioassay systems without a solvent by means of a gravity-flow column containing mirex bait. Fluctuations in the mirex concentration within individual tanks were not significant. The system is being used in toxicity and uptake tests. (Katz)
W75-10844

AN EVALUATION OF PERSISTENCY FOR WATER BORNE ORGANICS,
Worcester Polytechnic Inst., Mass.
For primary bibliographic entry see Field 5B.
W75-10850

5B. Sources Of Pollution

ORGANIC MATTER IN NATURAL WATER AND WATER TREATMENT,
New Hampshire Univ., Durham. Dept. of Chemistry.
J. H. Weber.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-243 915, $3.25 in paper copy, $2.25 in microfiche. Presented at New Hampshire Water Works Association Meeting, September 5, 1974. 12 p, 1 fig, 1 tab, 2 ref. OWRR A-035-NH(1).

Descriptors: *Organic matter, *Chemical properties, *Water treatment, Chelation, Metals, Ions, Potable water, Color, Ozone, New Hampshire.
Identifiers: Alum, Activated charcoal, Oyster River(N.H.), Metal chelates.

An overview of rivers and lakes, including the origin and general nature of their dissolved and undissolved material is given. The origin of organic material is mainly decaying vegetative matter mixed with or on top of soil. Chelating agents and metal chelates, the nature of organic matter in water, and isolation of organic matter from water are considered. Effects due to the presence of chelating agents in natural water are: dissolving of precipitated metal ions; precipitation of normally dissolved matal ions. Chelated metal ions are not removed by precesses that remove metal ions. One of several reasons to remove organic matter before domestic water usage is aesthetic as people do not like to drink colored water, although the amount or organic matter that causes the yellow is not considered toxic. The organic matter forms metal chelates. Chelating agents might prevent the removal of very toxic matals like lead, mercury, and cadmium. Treatment for organic matter includes application of alum, filtering through activated charcoal, and utilization of ozone. The chemical nature of organic matter was determined by processing more than six tons of water to isolate 30 g of organic matter from the Oyster River, New Hampshire. (Jones-Wisconsin)
W75-10351

CELLULOSE DEGRADATION IN WASTE WATER TREATMENT,
Uppsala Univ. (Sweden). Inst. of Biochemistry.
For primary bibliographic entry see Field 5D.
W75-10376

UTILIZATION OF A KRAFT EFFLUENT CHANNEL BY FISH AND AQUATIC ORGANISMS,
Florida Univ., Gainesville. School of Forest Resources and Conservation.
For primary bibliographic entry see Field 5C.
W75-10377

ORGANIC COMPOUNDS IN PULP MILL LAGOON DISCHARGE,
Washington Univ., Seattle. Coll. of Forest Resources.
For primary bibliographic entry see Field 5D.
W75-10402

ENVIRONMENTAL LIMITATIONS ON THE MICROBIAL DEGRADATION OF HYDROCARBONS IN TEMPERATE LAKES,
Wisconsin Univ., Madison. Dept. of Bacteriology.
For primary bibliographic entry see Field 5C.
W75-10407

ADSORPTION AND DEGRADATION OF CHLORBROMURON IN SOIL,
Agricultural Research Service, Stoneville, Miss. South Weed Science Lab.
K. E. Savage.
Weed Science, Vol 21, No 5, p 416-420, 1973.

Descriptors: *Adsorption, Toxicity, *Water pollution sources, Soils, Chromatography, *Microbial degradation, Biodegradation, Cucumbers, Pollutant identification.
Identifiers: *Chlorbromuron, Cucumis-sativus, *Freundlich equation, Phytotooxicity.

The adsorption-desorption equilibria of chlorbromuron (3-(4-bromo-3-chlorophenyl)-1-methoxy-1-methylurea) in soil conformed to the Freundlich equation. Values of the constants, k and n, ranged 4.2-12.3 and 1.2-2.5, respectively, in 8 soils. No significant linear correlation was detected between the Freundlich k values and soil texture, organic-matter content, pH, or water-holding capacity. Degradation studies were conducted using 14C-carbonyl-radiolabeled chlorbromuron in soil incubated at 18 or 32C, with and without prior autoclaving, and with and without glucose enrichment. Degradation was enhanced by the higher temperature and glucose amendment, and it was retarded by autoclaving. Thin-layer chromatography indicated no accumulation of the monomethyl or monomethoxy derivative of chlorbromuron in any of the treatments. Chlorbromuron degraded rapidly in the incubation studies. Rapid loss of phytotoxicity was also noted in a greehouse study with cucumber (Cucumis sativus L. 'Explorer') bioassay. Phytotoxicity from 4 ppmw (micro-g/g dry plant weight) chlorbromuron had diminished to a very low level after 12 wk.--Copyright 1974, Biological Abstracts, Inc.
W75-10414

EXPERIMENTAL INVESTIGATION ON THE BIOLOGICAL CONCENTRATION OF MERCURY-I. ON THE RATE OF MERCURY TRANSFER THROUGH THE FOOD CHAIN FROM JACK MACKEREL TO YOUNG YELLOWTAIL (IN JAPANESE),
Aichi Prefecture Fisheries Experimental Station, Miya (Japan).
For primary bibliographic entry see Field 5C.
W75-10441

RESIDUES OF POLYCHLORINATED BIPHENYLS (PCB) AND CHLORINATED PESTICIDES

IN FISH AND BIRDS OF THE PO DELTA, (RESIDUS DE POLYCHLOROBIPHENYLS (PCB) ET DE PESTICIDES CHLORES DANS LES POISSONS ET LES OISEAUX DU DELTA DU PO),
Bologna Univ. (Italy). Istituto di Biochimica.
R. Viviani, G. Crisetig, P. Cortesi, and E. Carpene.
Revue Internationale D'Oceanographie Medicale, Vol 35-36, p 79-90, 1974. 1 fig, 2 tab, 22 ref.

Descriptors: *Polychlorinated biphenyls, *DDT, *Pesticide residues, *Fish, *Birds, *Dieldrin, *Path of pollutants, Pesticides, Absorption, Chlorinated hydrocarbon pesticides, Water pollution sources, Food webs, Gulls, Pollutant identification.
Identifiers: *Po River(Italy), Tissue analysis, Bioaccumulation.

Residues of lindane, dieldrin, DDT and its metabolites and PCB found in fish and birds captured in the Po delta during 1972 were reported. In fish, chlorinated pesticides and PCB were always less than 1 ppm in the muscle while the liver contained up to 4 ppm of DDT and its metabolites. Gobius paganellus contained 12 ppm of PCB. The sea-gull (Larus ridibundus) showed the highest levels of DDT and its metabolites (4 ppm in the muscle and liver) while the common tern had the highest level of PCB (7.9 ppm in the muscle and 8.6 in the liver). The levels of chlorinated hydrocarbons in the muscles of fish were lower than the tolerance limits for public health (5 ppm) established in the U.S. (Katz)
W75-10446

THALLIUM: OCCURRENCE IN THE ENVIRONMENT AND TOXICITY TO FISH,
Fisheries Research Board of Canada, St. Andrews (New Brunswick). Biological Station.
For primary bibliographic entry see Field 5C.
W75-10449

RESOURCE DEVELOPMENT IN CANADA'S HIGH ARCTIC,
For primary bibliographic entry see Field 2C.
W75-10463

OCEAN POLLUTANTS POSE POTENTIAL DANGER TO MAN,
R. J. Seltzer.
Chemical and Engineering News, Vol 53, No 8, p 19-20, February 24, 1975.

Descriptors: *Water pollution effects, Oceans, *Waste disposal, Organic compounds, Model studies, Pollutants, Water pollution sources, *Path of pollutants.
Identifiers: *Hexachlorobenzene, Transuranic elements, Synthetic organic chemicals.

Studies are being conducted to assess materials and technologies and their potential impacts on ocean environments. Certain marine pollutants pose no threat at present levels, while others should be carefully monitored. While the oceans should play a useful role in waste disposal, their potential for diluting harmful effects is limited. A transport model to estimate the mass flow and ultimate fate of pollutants is being developed. Six groups of materials have been chosen for case studies: transuranic elements; synthetic organic chemicals; waste materials, sludges, and sediments dumped or discharged into the ocean; metallic wastes; medicinal wastes; and marine litter. The critical parameters were: rate of release into the environment; persistence in the environment; concentration factors for ocean compartments (such as estuaries or surface films) and bioaccumulation; and toxicity, both long and short range. Two materials of major concern are transuranic elements from nuclear weapons tests and hexachlorobenzene. The latter is the only synthetic organic chemical examined which seems to present a problem. Hexachlorobenzene is resistant to degradation, disperses easily through the food web, and has resulted in wildlife losses worldwide. Its sources are pesticides and wastes from factories manufacturing other chlorinated hydrocarbons. Doubts still remain about the impact of low-molecular weight halogenated hydrocarbons and tetracyclines and of aromatic hydrocarbons. (Prague-FIRL)
W75-10464

USCG SETS BROADER USE OF POLLUTION CONTROL SYSTEMS,
Coast Guard, Washington, D.C. Office of Marine Environment and Systems.
For primary bibliographic entry see Field 5G.
W75-10466

INTERNATIONAL EXPLORATION LOCATES MINERALS AND OILS,
National Science Foundation, Washington, D.C. Office for the International Decade of Ocean Exploration.
F. D. Jennings.
Sea Technology, Vol 16, No 1, p 29-30, January 1975.

Descriptors: Oceans, *Water pollution effects, Aquatic life, *Oil, Climates, Investigations, Metals, Surface waters, Exploration, Mineralogy, *Water pollution sources, Organic compounds.
Identifiers: *Minerals location.

Exploration by the Living Resources, Seabed Assessment, Environmental Forecasting, and Environmental Quality programs of the International Decade of Ocean Exploration has been conducted in the past two years, and further work is planned through 1977. Studies investigated the location of natural oil accumulations as well as areas of pollution and the effects of pollutants on marine organisms. The goal of these studies is the understanding of the role of the ocean in weather and climate and knowledge of circulation within the ocean. It was suggested that heavy metals, chlorinated hydrocarbons, and the water-soluble fractions of petroleum hydrocarbons be used to study pollution effects on aquatic life. Data now complete from the Geochemical Oceans Sections Study provide quantitative bases for knowledge of stirring and mixing processes of the sea and exchange of material between deep and surface waters. (Prague-FIRL)
W75-10467

TAR POLLUTION OF SIERRA LEONE BEACHES,
Fourah Bay Coll., Freetown (Sierra Leone). Inst. of Marine Biology and Oceanography.
W. Okera.
Nature, Vol 252, No 5485, p 682, December, 1974. 1 fig, 2 ref.

Descriptors: Oceans, *Plastics, Ships, Pollutants, Marine life, *Africa, *Water pollution sources, Water pollution effects.
Identifiers: *Sierre Leone, West Africa, Pelagic tar, Tankers, *Tar pollution.

Pelagic tar and plastic wastes have been found in parts of the Pacific and Atlantic oceans. Extensive and considerable fouling of the sandy beaches of Sierra Leone, West Africa, by tar lumps has been observed from June 1973 to July 1974. The extent of current pollution suggests that the whole Sierra Leone coastline, and perhaps those of flanking countries as well, may be subject to frequent tar pollution, proabably originating from the heavy, offshore traffc of tankers and ships. During ebb tide, at Lumley Beach, tar lumps and other debris are deposited on the sand in a series of crescent-shaped aggregations by the receding waves. The lumps are inhabited by a variety of marine organisms such as colonies of small goose barracles, and ghost crabs (Ocypode spp.). (Prague-FIRL)
W75-10472

AVERAGE TRACE ELEMENT COMPOSITION OF LOW LEVEL MARINE ATMOSPHERIC PARTICULATES,
Liverpool Univ. (England). Dept. of Oceanography.
R. Chester, and J. H. Stoner.
Nature, Vol 246, No 5429, p 138-139, November 16, 1973. 1 tab, 7 ref.

Descriptors: *Metals, *Trace elements, *Oceans, *Air pollution, Sampling, On-site data collections, Manganese, Nickel, Cobalt, Chromium, Tin, Lead, Zinc, *Pollutant identification, *Path of pollutants.

Data on the average trace metal composition of aeolian particulates from the lower atmosphere of various major wind systems over the World Ocean are presented. For the elements, Mn, Ni, Co, Ga, Cr, V, Ba, and Sr, the enrichment factors were reasonably close to unity, i.e., these elements were not significantly enriched in average low level marine aeolian particulates. In contrast, the elements Sn, Pb, and Zn were enriched in the aeolian particulates, relative to average crustal material, by one order of magnitude, even when geographical variations are smoothed out by taking a worldwide average. It was concluded that Sn, Pb, and Zn are being released preferentially into marine atmosphere (from sources which probably include the activities of man) and are concentrating, relative to average crustal material, in low level aeolian particulates. (Jernigan-Vanderbilt)
W75-10477

CHARACTERIZATION OF CADMIUM UPTAKE BY PLANT TISSUE,
California Univ., Davis. Dept. of Agronomy and Range Science.
J. M. Cutler, and D. W. Rains.
Plant Physiology, Vol 54, No 1, p 67-71, July, 1974. 2 tab, 7 ref, 22 ref.

Descriptors: Grains, *Cadmium, *Adsorption, *Metabolism, Plant physiology, Zinc, Copper, Mercury, Cytological studies.

The uptake of cadmium by excised root tissue of barley was investigated with respect to kinetics, concentration and interactions with various cations. The role of metabolism in Cd absorption was examined using a range of temperatures, anaerobic treatment, and chemical inhibitors. The uptake and distribution of Cd in intact barley plants was also determined. A large fraction of the Cd taken up by excised barley roots was apparently the result of exchange adsorption and was displaced by subsequent desorption with unlabeled Cd, Zn, Cu or Hg. Another fraction of Cd which could not be displaced by desorption in unlabeled Cd was thought to result from strong irreversible binding of Cd, perhaps on sites of the cell wall. The fraction of the Cd taken up beyond that by exchange adsorption by fresh roots was a linear function of temperature, and inhibited by conditions of low oxygen and by the presence of 2, 4-dinitrophenol. It was concluded that this fraction of Cd entered excised barley roots by diffusion. Diffusion, when followed by sequestering, probably accounts for the accumulation of Cd observed in intact barley plants. (Jernigan-Vanderbilt)
W75-10479

ABSORPTION OF CADMIUM, COPPER AND ZINC BY DOG WHELKS IN THE BRISTOL CHANNEL,
Bristol Univ. (England). School of Chemistry.
R. D. Stenner, and G. Nickless.
Nature, Vol 247, No 5438, p 198-199, January, 1974. 2 tab, 5 ref.

Descriptors: *Absorption, *Cadmium, Marine animals, *Heavy metals, *Copper, *Zinc, On-site data collections, Analytical techniques, Spectroscopy, *Pollutant identification, Channels.
Identifiers: Britol Channel, *Dog whelks.

120 dog whelks were collected. Ten specimens were analyzed for cadmium, copper and zinc, and the rest were transported to a clearly identifiable polluted area. The concentration of cadmium in the dog whelks increased at an appreciably slower rate than that of zinc. At the end of the fourth month, the cadmium was significantly lower than that in the native specimens, but it was increasing steadily. By the end of the second month, the zinc concentrations were statistically indistinguishable from those of native specimens. The copper concentrations remained considerably less than those in the native specimens. (Jernigan-Vanderbilt)
W75-10481

TOXIC TRACE ELEMENTS: PREFERENTIAL CONCENTRATION IN RESPIRABLE PARTICLES,
Illinois Univ., Urbana. School of Chemical Sciences.
For primary bibliographic entry see Field 5A.
W75-10482

REDISTRIBUTION AND CONCENTRATION OF MERCURY IN THE ENVIRONMENT,
Wisconsin Univ., Madison.
D. L. Gerner.
Mining Engineering, Vol 25, No 6, p 52-53, June, 1973, 7 ref.

Descriptors: *Mercury, *Human pathology, *Distribution, Organic compounds, Inorganic compounds, Public health, Poisons, Hazards, *Path of pollutants, Water pollution sources.

A brief overview of mercury in the environment and its toxic effects was given. The redistribution of this trace element by man and ways of controlling it are discussed. The concentration of the element in its organic and inorganic forms was discussed, and it was suggested that the best way to deal with the problem of mercury in the environment is to apply the techniques of preventive medicine. (Jernigan-Vanderbilt)
W75-10483

ARSENATE UPTAKE AND REDUCTION BY POCILLOPORA VERRUCOSA,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5C.
W75-10491

DISPERSION OF CONTAMINATED BEDLOAD PARTICLES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. W. Shen, and H. F. Cheong.
In: Proceedings Symposium on Statistical Hydrology, Arizona University, Tucson, August 31-September 2, 1971. Miscellaneous Publication No 1275, p 323-335, June 1974. 12 fig, 2 tab, 6 ref. OWRT B-014-COLO(4) NSF GK 11499, OWRT 14-01-001-1435.

Descriptors: *Bed load, *Dispersion, *Sediment transport, *Model studies, Bottom sediments, Sediments, Stochastic processes, *Path of pollutants, Streamflow, Channels, Mathematical models, Mathematical studies, Movement, Pollutants, Hydrology.

An analysis based on the concentration distribution function described the dispersion of contaminated particles released simultaneously from a source in the bed of a stream with steady, uniform flow. Lagrangian probabilistic model, in which the movement of each particle is described as an alternate sequence of steps and rest periods was used. It was shown that the concentration distribution was initially highly skewed and became progressively symmetrical with time so that it could be approximated by a Gaussian curve. The longitudinal location of the peak of the distribution function advanced slightly faster than the movement of the mass center of the distribution curve, so that after a sufficiently long time the peak approached the mass center. Also presented was a simplified procedure for deriving an excellent approximation to the envelope of the family of distribution curves parameterized by time, even when the shape factor r takes on nonintegral values. This yielded curve that is always uniformly lower than the envelope with the deviation between the two curves diminishing with time. For a dimensionless time scale greater than five, the error incurred was 5% and less, depending upon the value of r. (See also W75-10507) (Sims-ISWS)
W75-10526

A NOTE ON MIXED DISTRIBUTIONS IN HYDROLOGY,
State Univ. of New York, Syracuse. Coll. of Environmental Science and Forestry.
For primary bibliographic entry see Field 2E.
W75-10527

MEASUREMENT OF HYDRAULIC CONDUCTIVITY OF PEATS,
Guelph Univ. (Ontario). Dept. of Botany and Genetics.
For primary bibliographic entry see Field 7B.
W75-10536

PREDICTION OF TRIFLURALIN DIFFUSION COEFFICIENTS,
Agricultural Research Service, Stoneville, Miss. South Weed Science Lab.
L. E. Bode, C. L. Day, M. R. Gebhardt, and C. E. Goering.
Weed Science, Vol 21, No 5, p 485-489, 1973, Illus.

Descriptors: *Diffusion, *Herbicides, Forecasting, Mathematical models, *Soil moisture, Temperature, Soils, Soil temperature, *Path of pollutants, Water pollution sources.
Identifiers: *Trifluralin diffusion coefficients.

In the range of 4.4-49C, there is an exponential relationship between temperature and trifluralin (a,a,a-trifluoro-2,6-dinitro-N,N-dipropyl-p-toluidine) diffusion coefficients. Diffusion is low in airdry soil for all temperatures. It increases to a maximum value when the soil has 8-15% w/w (weight in weight) soil moisture content and then decreases steadily as moisture content increases. When the air-filled fraction of soil void space is reduced below approximately 40% v/v (volume in volume) by either compression or addition of moisture, diffusion begins to decrease. An equation was developed to predict trifluralin diffusion coefficients from a factorial experiment with 7 soil moisture contents, 5 soil temperatures and 2 bulk densities. Diffusion coefficients ranged 3.8 x 10 to the minus 11th power sq cm/sec-2.8 x 10 to the minus 6th power sq cm/sec. Fifteen terms were required in the prediction model to describe accurately the response surface of trifluralin diffusion coefficients. When the equation it was possible to predict trifluralin diffusion coefficients for any combination of measured soil parameters as long as they were represented by the range of the variables used in the experiment.--Copyright 1974, Biological Abstracts, Inc.
W75-10542

EVALUATION OF GROUND WATER RESOURCES: SACRAMENTO COUNTY,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 2F.
W75-10546

THE DRIFT OF MAYFLIES (EPHEMEROPTERA) IN THE BRAZOS RIVER, TEXAS,
Fish and Wildlife Service, Fort Worth, Tex. Div. of River Basin Studies.
T. J. Cloud, Jr., and K. W. Stewart.
J Kans Entomol Soc. Vol 47, No 3, p 379-396, 1974, Illus.

Descriptors: *Texas, *Mayflies, Aquatic insects, Invertebrates, Aquatic drift, Rivers, Bioindicators, Path of pollutants.
Identifiers: Baetis-sp, *Brazos River(Tex), Heptagenia-sp, Isonychia-sicca-manca, Neochoroterpes-mexicanus, Tricorythodes-sp.

An investigation into the drift-ecology of the mayfly populations of the Brazos River, a Southwestern USA river, was conducted from April, 1972-Feb., 1973. Bi-monthly drift samples were used to delineate the nocturnal periodicities and seasonal fluctuations of 6 spp. (Neochoroterpes mexicanus, Tricorythodes sp., Baetis sp., Caenis sp., Heptagenia sp. and Isonychia sicca manca), 3 of which are new and as yet undescribed. Highest levels of behavioral drift, expressed in drift density units, occurred during the night of the summer sample dates. The drift of exuviae seems to be an accurate indicator of mayfly emergence in the Brazos River.--Copyright 1974, Biological Abstracts, Inc.
W75-10558

PHOSPHORUS IN PERCOLATES FROM MANURED LYSIMETERS,
Guelph Univ. (Ontario). Dept. of Land Resource Science.
D. G. Bielby, D. A. Tel, and L. R. Webber.
Canadian Journal of Soil Science, Vol 53, No 3, p 343-346, 1973.

Descriptors: *Corn(Field), *Farm wastes, *Phosphorus, *Lysimeters, Percolation, Poultry, Water pollution sources.

The quantities and concentrations of soluble P in the percolates from lysimeters with applications of liquid poultry manure over a 3-yr period are reported. Three corn plants were grown on each lysimeter, and the group of lysimeters was surrounded by corn plants to avoid an oasis effect. Aliquots of the percolates were obtained when the accumulated volume was equivalent to or greater than a 1-cm depth over the surface area of a lysimeter. The amount of P in the percolates during the periods prior to planting and during the growing season was very low, trace-0.003 g/lysimeter. The largest amount of P, 0.003 g, was found in the percolates from nonmanured lysimeters prior to the planting period. This loss would be equivalent to 0.05 kg/ha. In all treatments, the addition of water after harvest removed more P than from the nonirrigated lysimeters. The water was added in small amounts several times/wk. A pulse-type of input contributed to a greater movement of P than a continuous input. Over the 3-yr period, the P added in the 4 treatments was equivalent to 50, 408, 1240 and 1590 kg/ha. During the 3 yr the percolates contained the equivalent of 0.35, 0.65, 0.38 and 0.35 kg of P/ha for the 4 treatments, respectively; and the corresponding concentrations of P in the percolates were 0.029, 0.057, 0.033 and 0.034 mg/l. Applied P tends to remain immobile in a soil. Attenuation of the P would occur as the water moved through the subsoil.--Copyright 1974, Biological Abstracts, Inc.
W75-10573

THE LOXAHATCHEE - A RIVER IN DISTRESS, SOUTHEAST FLORIDA,
Geological Survey, Miami, Fla.
For primary bibliographic entry see Field 4C.
W75-10588

A RIVER-QUALITY ASSESSMENT OF THE UPPER WHITE RIVER, INDIANA,
Geological Survey, Indianapolis, Ind.
W. J. Shampine.
Available from NTIS, Springfield, Va 22161 as PB-243 739, $4.75 printed copy, $2.25 in

microfiche. Water-Resources Investigations 10-75, 1975. 68 p, 28 fig, 12 tab, 28 ref.

Descriptors: *Water quality, *River basins, *Indiana, *Chemical analysis, *Water pollution sources, Nutrients, Pesticide residues, Biological communities, Municipal wastes, Industrial wastes, Reservoirs, Thermal stratification, Bottom sediments, Land use, Sewage effluents, Path of pollutants.
Identifiers: *Upper White River(Ind).

The White River in Indiana can be subdivided into five distinct river-quality sections. Section 1, above Winchester, drains a rural area and is affected by agricultural land use, although the river quality generally is good. Section 2, between Winchester and Muncie, is affected by urbanization at Winchester and Muncie. The river quality generally is good, although stretches near the cities occasionally have problems. Section 3, Muncie to Anderson, is polluted by urban effluent. Section 4, Anderson to Indianapolis, is further polluted (particularly at Anderson), but the river tends to recover considerably at Indianapolis, and becomes relatively clean. Section 5, below Indianapolis, is polluted. In October 1972 the nitrogen load increased from 5.45 tons per day above Indianapolis to 18.43 tons per day below the city. Ten micrograms per kilogram of DDD, 20 of chlordane, and 20 of polychlorinated biphenyls were extracted from sediments in the White River below Indianapolis. The median coliform bacteria count below Indianapolis is 360,000 colonies per 100 millilitres of water. The only benthic invertebrates found in the White River below Indianapolis are pollution-tolerant species, and very few fish are found. Conditions are similar, but to a somewhat lesser degree, below Muncie. (Woodard-USGS)
W75-10600

PROBLEMS RELATED TO WATER QUALITY AND ALGAL CONTROL IN LOPEZ RESERVOIR, SAN LUIS OBISPO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
R. H. Fuller, R. C. Averett, and W. G. Hines.
Available from NTIS, Springfield, Va 22161 as PB-243 466, $4.25 printed copy, $2.25 in microfiche. Water-Resources Investigations 47-74, February 1975. 46 p, 18 fig, 6 tab, 34 ref.

Descriptors: *Water pollution sources, *Algae, *Algal control, *Reservoirs, *California, Water quality, Hydrologic data, Rainfall, Streamflow, Sediment transport, Water yield, Sediment yield, Dissolved oxygen, Water temperature, Limnology, Nuisance algae, Chemical analysis, Diatoms, Nutrients, Copper sulfate, Water quality control.
Identifiers: *Lopez Reservoir(Calif).

Lopez Reservoir in San Luis Obispo, Calif., is a multipurpose impoundment that was filled during a 30-weed period following a series of intense storms during the winter 1968-69. The reservoir is used for flood control, water supply, and recreation. At full pool Lopez Reservoir has a surface area of 974 acres, a maximum depth of 145 feet, and a shoreline of 22 miles. Nuisance algal blooms have been a frequent occurrence in the reservoir since the first summer after filling (1969). Dominant bloom species include the blue-green alga Anabaena unispora, the diatoms Stephanodiscus astraea and Cyclotella operculata, and the green algae Pediastrum duplex and Sphaerocystis schroeteri. During a bloom of A. unispora in May 1972, the total cell count at the lake surface was almost 100,000 cells per millilitre of water. Lopez Reservoir is thermally stratified from April until November. Dissolved-oxygen stratification closely parallels the thermal stratification. Anoxic conditions begin to develop in mid-May, and by early July all water below a depth of 40 feet is oxygen deficient. The application of copper sulfate to reduce algal production has met with little success. Possible application rates and methods of determining application rates based upon water chemistry are presented. (Woodard-USGS)
W75-10601

COPPER, ZINC AND TOTAL PROTEIN LEVELS IN THE PLASMA OF SOCKEYE SALMON (ONCORHYNCHUS NERKA) DURING THEIR SPAWNING MIGRATION,
Memorial Univ. of Newfoundland, St. Johns. Marine Sciences Research Lab.
For primary bibliographic entry see Field 5C.
W75-10613

ON THE ACCUMULATION OF ORGANOCHLORINE PESTICIDES, PCB AND CERTAIN HEAVY METALS IN FISH AND SHELLFISH FROM THAI COASTAL AND INLAND WATERS,
Bundesforschungsanstalt fuer Fischerei, Hamburg (West Germany). Isotopenlaboratorium.
E. Huschenbeth, and U. Harms.
Archiv fur Fisherei Wissenschaft, Vol 26, No 3, p 109-122, April 1975. 1 fig, 10 tab, 13 ref.

Descriptors: Fish, Molluscs, Crustaceans, DDT, DDE, Dieldrin, *Organic pesticides, Copper, Zinc, Cadmium, Lead, Mercury, *Heavy metals, *Bioassay, Environmental effects, Laboratory tests, Sampling, Water pollution sources, *Polychlorinated biphyenls, Pollutant identification.
Identifiers: TDE, Lindane, Bioaccumulation, Tissue analysis, *Thailand(Gulf of Siam), Species.

819 samples of 27 genera of fish, 4 genera of crustaceans, and 3 genera of molluscs were collected from the Thai coast and inland areas and analysed for DDT, TDE, DDE. Lindane, Dieldrin, PCB, copper, zinc, cadmium, lead and mercury content. The study suggested that no need immediately existed for the development of expensive monitoring programs as pesticides, PCB and heavy metals concentrations in Thai fish were comparable to North Atlantic and North Sea fish. (Katz)
W75-10616

ADDITIONAL STUDIES OF THE FISHES, MACROINVERTEBRATES AND HYDROLOGICAL CONDITIONS OF UPLAND CANALS IN TAMPA BAY, FLORIDA,
National Marine Fisheries Service, St. Petersburg, Fla. Southeast Region.
For primary bibliographic entry see Field 5C.
W75-10617

THE CONCENTRATION OF MERCURY, COPPER, NICKEL, SILVER, CADMIUM AND LEAD IN THE NORTHERN ADRIATIC ANCHOVY, ENGRAULIS ENCRASICHOLUS, AND SARDINE, SARDINA PILCHARDUS,
Australian Inst. of Marine Sciences, Townsville.
M. Gilmartin, and N. Revelante.
Fishery Bulletin, Vol 73, No 1, p 193-201, January 1975. 10 tab, 32 ref.

Descriptors: Metals, *Heavy metals, *Mercury, *Copper, *Nickel, *Silver, *Cadmium, *Lead, Marine fish, *Fish physiology, *Bioassay, Laboratory tests, Path of pollutants, Water pollution sources, Sampling, Water pollution effects.
Identifiers: *Anchovy, *Sardine, Engraulis encrasicholus, Sardina pilchardus, Bioaccumulation, Tissue analysis, *Adriatic Sea.

Levels of mercury, copper, nickel, silver, cadmium and lead were determined in various tissues of the northern Adriatic anchovy, Engraulis encrasicholus, and sardine, Sardina pilchardus throughout a seven month fishing season. The highest concentrations of nickel, silver, cadmium and lead occurred in the skin and gills, with little interspecific differences and no unusually high values. The highest concentrations of mercury and copper occurred in internal tissues, with the anchovy showing markedly higher concentrations than the sardine. Total mercury concentrations in anchovy muscle ranged from 70 to 215 nanograms per gram wet weight, concentrations 2-4 times greater than in the same or similar anchovy species off northwestern Africa, southeastern United States, and California. (Katz)
W75-10620

ABSORPTION, METABOLISM, AND EXCRETION BY GOLDFISH OF THE ANIONIC DETERGENT SODIUM LAURYL SULPHATE,
Unilever Ltd., Sharnbrook (England). Unilever Research Lab.
For primary bibliographic entry see Field 5C.
W75-10626

UPTAKE, ELIMINATION AND BIOTRANSFORMATION OF THE LAMPRICIDE 3-TRIFLUROMETHYL-4-NITROPHENOL (TFM) BY LARVAE OF THE AQUATIC MIDGE CHIRONOMUS TENTANS,
Viterbo Coll., La Crosse, Wis. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W75-10629

A THEORY OF THE MASS TRANSPORT OF PREVIOUSLY DISTRIBUTED CHEMICALS IN A WATER-SATURATED SORBING POROUS MEDIUM: 4. DISTRIBUTIONS,
Oregon State Univ., Corvallis.
F. T. Lindstrom, and L. Boersma.
Soil Science, Vol 119, No 6, p 411-420, June 1975. 1 fig, 4 tab, 12 ref, append. NIEHS Grant ES000-40.

Descriptors: *Mass transfer, *Chemicals, *Porous media, *Boundary processes, Inflow, Sorption, Dispersion, *Distribution, Numerical analysis, Leaching, Saturated flow, Velocity, Equations, Convection.
Identifiers: Sorbed phase, Free phase, Pulsed system.

A quantitative analysis of a mass transfer problem of chemicals in porous media was presented. The specific problem considered was that where the inflow boundary has an initial zero concentration, it receives an inflow of chemical concentration U sub O for a period of finite duration T sub 1, after which the inflow continues with water of zero chemical concentration. Free and sorbed phase chemical concentration distribution equations were first obtained for dispersion during the time period O less that t less than or equal to T sub 1, during which the chemical enters the soil. The solutions were presented in the form of single convolution integral expressions obtained by Laplace transform techniques. This resulting distribution became the initial concentration distribution for the subsequent leaching process during the time period T sub 1 less than t less than or equal to T sub 2. Equations were developed which describe the free and sorbed phase chemical distributions resulting from the leaching process. Solutions to both sets of equations were obtained by numerical quadrature techniques. A typical example was displayed. The scheme that was presented is easily adaptable to a repeating or 'pulsed' system. Periodic application of a fertilizer, followed by irrigation, is an example of such a system. (See also W73-07668 and W72-03459) (Visocky-ISWS)
W75-10632

OIL IN THE SEA.
The Dock and Harbour Authority, Vol 55, No 651, p 323, January, 1975.

Descriptors: *Oil pollution, *Oceans, Urban runoff, Oil industry, Water pollution sources, Water pollution effects, Microorganisms, Biodegradation, Organic compounds, *Oil.
Identifiers: Petroleum hydrocarbons.

The United States National Research Council has prepared a report on petroleum hydrocarbons entering the world's oceans. Of six million tons of these hydrocarbons that enter the world's oceans per year, about 35% come from transportation activities, including tanker bilges, drydocks, terminals operations, and accidents; 31% from river and urban runoff; 13% from coastal refineries and municipal and industrial wastes; 10% from atmospheric fallout; 10% from natural seepage; and 1.3% from offshore oil operations. One year's input of oil is thought to exist on the open sea as floating specks and lumps. Tar masses have appeared in formerly unpolluted areas worldwide, originating primarily from tanker washings and bilge discharges. Reliable information on the rates of biodegradation of oil by microorganisms in the oceans was not available. (Prague-FIRL)
W75-10640

PREDICTING THE CONCENTRATION OF AQUATIC HERBICIDE RESIDUES IN WATERWAYS,
Commonwealth Scientific and Industrial Research Organization, Griffith (Australia). Div. of Irrigation Research.
E. M. O'Loughlin.
Hydrology Symposium, Armidale, Australia, 1975. The Institution of Engineers Australia, Preprints of Papers, p 56-60, May 1975. 6 fig, 7 ref.

Descriptors: *Herbicides, *Irrigation canals, *Water pollution, *Aquatic weed control, Irrigation water, , Diffusion, Dispersion, Model studies, Persistence, Pesticide toxicity, Pesticide residues, Forecasting.
Identifiers: *Acrolein.

Contact herbicides are commonly used for controlling aquatic weed growth in irrigation channel systems. One of the most effective, acrolein, is toxic to aquatic life, and care is needed to avoid undesirable effects outside the target area. Methods are given for predicting the attenuation of the peak herbicide concentration and the total dose experienced by weeds or other life in the channel. Simple one-dimensional expressions provide conservation estimates for maximum concentration and dose. Three-dimensional effects are important only very close to the point of herbicide injection. (CSIRO)
W75-10648

TRACE ELEMENTS IN MELBOURNE RIVERS - AN INTERLABORATORY ANALYSIS,
Materials Research Labs., Melbourne (Australia).
For primary bibliographic entry see Field 5A.
W75-10649

EVALUATION OF DISPOSAL AREAS IN JAMES RIVER; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W75-10669

WATER POLLUTION PROBLEMS ASSOCIATED WITH CONTROL OF STACK GAS EMISSION,
National Lime Association, Washington, D.C.
C. J. Lewis.
In: Proceedings of the 27th Industrial Waste Conference, May 2-4, 1972, Purdue University, Lafayette, Indiana, Engineering Extension Series No 141, Part 2, p 1089-1092. 1 tab.

Descriptors: *Waste pollution sources, *Air pollution, *Cleaning, *Gases, Metallurgy, Powerplants, Coal, Sulfur compounds, Fly ash, *Path of pollutants, Waste disposal, Economics, Carbon dioxide.
Identifiers: *Wet scrubbers, *Stack gas emissions, Particulate matter.

The water pollution potential resulting from the clean up of stack emission gases and particularly the clean up of gases from metallurgical smelters and coal burning powerplants is discussed. While pollutants in the gas of coal burning powerplants and metallurgical smelters are generally referred to as particulate matter, oxides of nitrogen, sulfur dioxide, and carbon dioxide, they may also contain many elements which volatilize in one form or another and terminate in the aqueous scrubbing medium. Few of the many technologies advanced from the treatment of gases from these particular sources have been attempted commercially; some are operating successfully due mainly to local circumstances where economics or end uses are favorable. Few, if any, treatment technologies have adequately described or provided means for the prevention of water pollution from the clean up of these gases. A possible solution is that a water treatment facility be designed into every stack gas clean up system using an aqueous medium for scrubbing which would include sludge dewatering for permanent storage or use in construction materials. An environmental clean up program based on economic efficiency cannot generate a dollar profit in today's societal structure. Emission and effluent standards may have to be revised to meet an economically acceptable solution. (Auen-Wisconsin)
W75-10691

DETERIORATION OF WATER QUALITY IN DISTRIBUTION SYSTEMS,
Missouri Univ., Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5F.
W75-10711

OIL REUSE--A NATIONAL NEED,
Environmental Quality Systems, Inc., Rockville, Md.
For primary bibliographic entry see Field 5D.
W75-10740

THE SOURCE AND SUPPLY OF VIRGIN LUBES,
Sun Oil Co., Philadelphia, Pa.
D. W. Twomey.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Inc., Washington, D.C., p 9-16, 1974. 6 fig.

Descriptors: *Oil, *Oil wastes, *Oil industry, Waste disposal, Oil pollution, Industrial wastes, Recycling.
Identifiers: *Lube oils, Re-refining.

Manufacturing lube oils is expensive in both capital and operational cost; relatively few barrels of crude oil within a refinery system are made into lube--only 3-6% in a fully integrated refinery. The supply of lubes is not easily or inexpensively increased by additions to existing plants while the demand for lubes has grown rapidly during a period of declining capacity. Two solutions are offered for meeting national objectives of an adequate supply for the domestic market and maintaining foreign markets for profit and trade balance: the addition of domestic capacity to produce additional lubes; and, the conservation of lubes. A large percentage of lubes can be recovered. These include railroad engine lubes, transformer oil, industrial hydraulic oil, circulating oil for lubrication, industrial gear oil, emulsifiable cutting oils, and gas absorption oil. These oils can be economically recovered for secondary use because they exist in large quantities in relatively few locations and the large volume has already created a disposal problem. The pressures of supply, cost and proper disposal should work together to make reconditioning or re-refining a large and valuable business. (See also W75-10739) (Orr-FIRL)
W75-10741

WASTE OIL MANAGEMENT--THE ENVIRONMENTAL PROTECTION AGENCY'S ROLE,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10742

DISPOSAL OF USED CRANKCASE AND OTHER OILS IN CANADA,
Department of the Environment, Ottawa (Ontario).
For primary bibliographic entry see Field 5D.
W75-10743

WASTE OIL IN MARYLAND: A POLLUTANT OR A RESOURCE,
Maryland Environmental Service, Annapolis.
M. T. Long.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, Washington, D.C., Information Transfer, Inc., Washington, D.C., p 43-54, 1974. 2 ref.

Descriptors: *Oil, *Oil wastes, *Waste disposal, *Oil industry, Water pollution sources, Industrial wastes, Fuels, Maryland, Industrial wastes.

A study was performed by the Maryland Environmental Service and the EPA to determine the amounts and characteristics of waste oils in Maryland and to design a program for the collection, transportation, processing and use of these oils. The design constraints were that all of the waste oils generated in the State be accepted, that the majority of the waste oils be converted into fuel, that present technology be used and that environmental protection be strongly considered. An estimated 18.5 million gallons of waste oil were generated in Maryland in 1972. Maryland has the technology to feasibly collect all of the waste oils produced in the state, to process these oils into fuel oils and to dispose of non-processable oils and residues in an environmentally acceptable way. Such a waste oil recovery and reuse program is outlined. Mathematical modeling of collection and transportation systems, preliminary plant design, market analysis and the constraints imposed, indicate that the program can be self-supporting at volumes greater than 30 mgy. The proposed program would have several advantages including alleviation of fuel oil shortages during the winter months, reduction of environmental damage to the water, land, and air resources of Maryland, reduction of high volumes of waste oil spills and the attendant cost of clean-up, prevention of waste of a resource, and reduction of maintenance cost in sewers and municipal treatment plants. (See also W75-10739) (Orr-FIRL)
W75-10744

WASTE OIL: THE RECAPTURE OF AN ENERGY RESOURCE (THE GENERATION, DISPOSAL AND RECOVERY OF WASTE OIL IN THE NEW YORK METROPOLITAN AREA),
Council on the Environment of New York City.
For primary bibliographic entry see Field 5D.
W75-10745

WASTE LUBRICATING OIL CHARACTERISTICS--DO THEY VARY GEOGRAPHICALLY, SEASONALLY, AND WITH ORIGIN,
American Petroleum Inst., New York. Task Force on Utilization of Waste Lubricating Oils.
R. C. Carter.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Inc., Washington, D.C., p 73-90, 1974. 14 tab.

Descriptors: *Oil, *Oil wastes, *Waste disposal, *Oil industry, Industrial wastes, Water pollution sources, Laboratory tests.
Identifiers: Lubricating oils.

The American Petroleum Institute is studying the characteristics of waste lubricating oils as the first phase of a project to determine how to make economic use of these used oils. The raw analytical data from samples representing winter driving conditions from thirteen representative locations throughout the continental U.S. are presented. The second phase of the project will involve burning tests to demonstrate the feasibility of burning small ratios of waste fuel oil blends without significant impacts on the environment. The continental U.S. was divided into five geographical areas--Pacific Coast, Rocky Mountain, Plains States, East Coast, and Mid-West Rural--then from each of the first four of these zones three cities or city areas were selected to have samples taken from it. Water content, flash point, ASTM distillation to 450 F, sulfated residue, aluminum, barium, calcium, copper, iron, lead, magnesium, phosphorus, sodium, zinc, total bromine, and total chlorine, and sulfur contents were determined on the hydrocarbon layer. (See also W75-10739) (Orr-FIRL)
W75-10746

OILY BILGE FROM COMMERCIAL VESSELS,
Environmental Quality Systems, Inc., Rockville, Md.
R. Waller.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Inc., Washington, D.C., p 185-199, 1974. 4 tab.

Descriptors: *Oily water, *Ships, *Water pollution sources, *Oil pollution, Pollutant identification, Fuels, Oil wastes, Recycling, Port authorities, Minnesota.
Identifiers: *Bilge water, Re-refining industry, Duluth(Minn).

A grant has been provided to the Seaway Port Authority of Duluth (Minn) to characterize the sewage, bilge, ballast, dunnage and garbage from the various vessels that enter Duluth Harbor. The major marine waste categories include: sanitary sewage; other sewage; garbage/refuse; dunnage; ballast water; cargo loss; tank washing; and, spilled cargo. Over sixty samples of sanitary sewage, bilge, ballast, garbage and dunnage were taken from commercial vessels entering Duluth Harbor. The oil content and total volume of bilge waters varies considerably between vessels. Diesel-driven vessels appear to generate a bilge water that can be quite high in oil content although the volume of bilge water generated is less than that from steam-driven vessels. The bulk of the data presented is for vessels with no onboard oily waste control system. Waste oil re-refiners expecting to handle bilge water must be prepared to accept a highly variable feedstock. (See also W75-10739) (Orr-FIRL)
W75-10752

SHIPYARD PROBLEMS WITH OILY WASTES,
A. C. K. Clark.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Inc., Washington, D.C., p 201-205, 1974.

Descriptors: *Ships, *Oil wastes, *Oily water, *Waste disposal, Recycling, Water pollution sources, Facilities, Waste treatment, Port authorities.
Identifiers: *Shipyards, Re-refining.

The receiving and disposing of oily wastes from ships by shipyards has been an opportunity for economically alert shipyards. The shipyards could profit doubly by this -- charging ships a fee for offloading their oily wastes and then saving on the cost of purchasing fuel by separating and then burning the oil from the ships. Receiving slop barges were towed out to ships at anchorage or at piers, to be loaded with slop oil and towed ashore for disposal of the wastes. Powered barges with centrifuges received many thousands of gallons of oil wastes, pumping the centrifuged water back into the harbor. Shipyard settling tanks separated the remaining oil and water; the residual water was pumped into the harbor. However, current regulations place limitations on the amount of oily water released to a harbor and on the amount of harmful emissions from the burning of fuels. The regulations provide that no oil or oily water may be dumped into the harbor that would create sheen on the surface. Equipment to reduce the amount of residual oil in oily wastes to such low levels is not currently available therefore, alternate methods of slop disposal must be found. The quantities of wastes received by shipyards may seem small to the oil re-refining industry, but they are large problems for shipyards that do not have suitable disposal facilities. Such facilities are economically non-viable for individual shipyards to build and therefore should come under the control of port authorities. (See also W75-10739) (Orr-FIRL)
W75-10753

CHARACTERISTICS OF OIL POLLUTION IN AND AROUND U.S. WATERS,
Coast Guard, Washington, D.C.
P. W. Van Voorhis.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Inc., Washington, D.C., p 207-224, 1974. 6 fig, 5 tab, 8 ref.

Descriptors: *Oil pollution, *Coast Guard regulations, Pollutant identification, *Oily water, *Oil wastes, Water pollution, Oil-water interfaces, Oil spills, Water pollution sources, Federal Water Pollution Control Act.
Identifiers: Chemical Hazard Response Information System(CHRIS), 1972 Federal Water Pollution Control Act Admendments.

One of the effects of the 1972 amendments to the Federal Water Pollution Control Act was to extend and strengthen the U.S. Coast Guard's regulatory authority for the control of oil and hazardous substances discharged into U.S. coastal waters. The oil pollution problem in the U.S. today, and the Coast Guard's growing program to combat it are discussed. The main emphasis is on the oil discharges which have occurred in or upon U.S. waters between 1970 and 1972, concentrating on frequency, volume, causes and characteristics, as well as the problems and expense associated with removal. The Coast Guard has been developing a pollution response program which involves field personnel organized to effectively respond to a pollution incident, district and Headquarters coordinating and administrative elements, and equipment to be utilized by field personnel in containment and removal activities. The Chemical Hazard Response Information System (CHRIS) was developed and placed in operation during the spring of 1974. CHRIS provides field personnel with the necessary information to make an effective response to discharges of hazardous polluting substances. The Coast Guard's research and development program has been working toward the development of equipment to be utilized in offshore and fast current oil discharges. Research has also been aimed toward reducing the quantity of oil released, controlling the spread of released oil, and removing oil from water. (See also W75-10739) (Orr-FIRL)
W75-10754

QUALITY PRODUCTS FROM USED PETROLEUM OILS,
For primary bibliographic entry see Field 5D.
W75-10756

RUNOFF OF OILS FROM RURAL ROADS TREATED TO SUPPRESS DUST,
Edison Water Quality Research Lab., N.J.
F. J. Freestone.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Incorporated, Washington, D.C., p 375-393, 1974. 6 fig, 7 tab, 3 ref.

Descriptors: *Oil, *Rural areas, Metals, Lead, Runoff, Roads, *Oil pollution, Oil wastes, *Path of pollutants.
Identifiers: Oil runoff, Lead pollution, Dust suppressants.

Waste crankcase oils applied to rural roads in the United States for the purpose of dust control contain about one percent by weight of lead compounds. In Hunterdon County, New Jersey, where roads are oiled twice yearly, two rural roads were examined to determine whether or not oil leaves the roads. Of the oil applied, it was estimated that about one percent remains in the top inch of road surface material and that oil penetration below the top inch is minimal. Oil may leave the road during wet weather by flotation from wet road surface material; lead also leaves the road surface with runoff. A considerable amount of lead--about 200 mg/kg--may be associated with dust particles on the road and may be carried by winds to contaminate crops and fields adjacent to the roads. It is not possible to quantify the amount of oil runoff. However, the ecological consequences of runoff oil and its accompanying heavy metals such as lead need to be studied further. (See also W75-10739) (Prague-FIRL)
W75-10766

SEEPAGE FROM RECHARGE AND LANDFILL DITCHES,
California Univ., Berkeley. Dept. of Geological Engineering.
P. A. Witherspoon, and T. N. Narasimhan.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Specialty Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 39-66, 1974. 12 fig, 2 tab, 6 ref, 2 append. Army Contract DACW05-71-C-0114.

Descriptors: *Path of pollutants, *Groundwater recharge, *Landfills, *Model studies, *Seepage, Recharge, Groundwater, Groundwater movement, Water pollution, Water pollution control, Mathematical models, Leaching, Subsurface drainage, Groundwater potential, Flow, Permeability, Soil water movement, Pit recharge, Induced infiltration.

An investigation was made of steady-flow rectangular recharge pits into two dimensional flow regions using a numerical method of analysis. In the case of single layer systems, the effects of the dimensions of the flow region, pit size, hydraulic gradient and anisotropy on total flow rates from the pit were investigated. In addition, the possibility of reducing pit leakage by means of a low-permeability lining in the recharge pit was investigated. For the particular two-dimensional systems studied, it was found that the overall flow rate increases with increasing hydraulic gradient, but in a slightly non-linear manner. By varying the width and depth of the recharge pit it was possible to determine that optimum pit dimensions exist, beyond which only slight improvement in flow rates can be accomplished by increasing pit dimensions. For an isotropic, single layer system, the results of this work suggest that these optimum dimensions are attained when both the depth and the width of the pit are 0.1 to 0.2 times the thickness of the flow region. In the third dimension, the recharge pit is in the form of a long ditch or channel. The results imply that in artificial recharge operations, considerable costs could be avoided by not designing recharge pits with dimensions greater than the optimum values. On the other hand, in the case of landfill operations, the results suggest that increasing the depth and/or width of the pit will not necessarily cause propor-

tional increases in the volume of leachates entering the groundwater system. (See also W75-10769) (Sims-ISWS)
W75-10770

CHANGE IN QUALITY OF PUMPED DRAINAGE EFFLUENT,
Bureau of Reclamation, Aurora, Colo.
E. J. Carlson.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 195-223, 1974. 8 fig, 3 tab, 5 ref.

Descriptors: *Drainage wells, *Irrigation, *Arizona, *Model studies, Pumping, Wells, Groundwater, Water quality, Hydraulic models, Theoretical analysis, Laboratory tests, Mathematical models, Aquifers, Aquifer testing, Saline water, On-site data collections, Irrigation effects.
Identifiers: *Gila project(Ariz).

Hydraulic model studies were made to obtain insight into the process of removing saline water from a two-part aquifer with a pumped well. Theoretical equations of the process were developed and checked by the model study. These equations were applied to field data from Wellton-Mohawk Division, Gila Project, Arizona, to predict future change in salinity of the drainage effluent. Hydraulic model studies verified the form of the exponential equation which describes the change in salinity of the pumped effluent from an aquifer initially filled with saline water of higher concentration that the replacement irrigation deep percolation water. Assuming that the pumping operation in the Wellton-Mohawk Division will continue in a pattern similar to that from 1966 through 1972, the average salinity of the drainage effluent will decrease exponentially. Salt concentration measurements made in the Wellton-Mohawk main conveyance channel are the best source of data for determination of the weighted average salinity effluent conditions. These data were used to predict future average salinity values for Wellton-Mohawk drainage flows. A system's analysis study has been made and a 'Drainage Operations Scheduling Model' developed. This mathematical model should be helpful in developing future pumping schedules. (See also W75-10769) (Humphreys-ISWS)
W75-10779

FIVE YEAR STUDY OF DES MOINES RIVER WATER QUALITY,
Iowa State Univ., Ames. Engineering Research Inst.
E. R. Baumann, J. G. DeBoer, and C. S. Oulman.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 711-727, 1974. 9 fig, 4 tab, 2 ref.

Descriptors: *Water quality, Pollutants, *Agricultural runoff, *Iowa, Rivers, Dams, *Pollutant identification, *Water pollution sources, Biochemical oxygen demand, Nitrogen compounds, Phosphorus compounds, Chlorides, Coliforms, Sampling, Leaching, Water analysis, On-site data collections, On-site investigations, Agriculture.
Identifiers: *Des Moines River(Ia).

The Des Moines River is the major waterway for a large part of central Iowa. One major dam has been constructed on this river and a second is under construction. Saylorville Dam, expected to be completed in 1975, is located a few miles north of Des Moines. This preimpoundment study of Des Moines River water quality is to be followed by a post-impoundment study when the Saylorville Dam is completed. During this study, beginning in July, 1967, samples of Des Moines River water have been collected from a number of sampling points. Data pertaining to a number of water quality parameters at one station were analyzed to determine whether any trends were apparent that would suggest the need to make additional analyses or studies before the reservoir is filled. These data were reported along with results of an investigation of the sources of pollutants. Sources related to farming and the agricultural industry were found to be major contributors to the pollution of the Des Moines River. It was concluded that the protection of the water quality of the Saylorville Reservoir will depend to a large extent in the future on the management practices that are employed by the agricultural community within the watershed area. (See also W75-10769) (Sims-ISWS)
W75-10803

EFFECT OF AGRICULTURAL USE ON WATER QUALITY FOR DOWNSTREAM USE FOR IRRIGATION,
Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering.
For primary bibliographic entry see Field 5G.
W75-10805

A REMOTE SENSING LASER FLUOROMETER,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 5A.
W75-10831

GROUNDWATER PROTECTION IN HIGHWAY CONSTRUCTION IN THE CATCHMENT AREA OF THE CITY OF BERNE AT KIESEN (GRUNDWASSERSCHUTZ BEIM AUTOBAHN IM FASSUNGSGEBIET STADT BERN IN KIESEN),
For primary bibliographic entry see Field 5C.
W75-10837

ACTMO, AN AGRICULTURAL CHEMICAL TRANSPORT MODEL,
Agricultural Research Service, Chickasha, Okla.
M. H. Frere, C. A. Onstad, and H. N. Holtan.
USDA Report ARS-H-3, 54 p, June 1975. 18 fig, 17 tab, 57 ref.

Descriptors: *Mathematical models, *Water pollution sources, Sediment transport, Runoff, Model studies, Watersheds(Basins), Nutrients, Pesticides, Leaching, Erosion, *Chemicals, *Path of pollutants, *Agricultural watersheds.

A mathematical model has been developed to describe the movement of chemicals in and across an agricultural watershed. For each storm in a series of model predicts the mean concentration of the chemical in the runoff, the total amount carried by runoff water and sediment, and the location of the chemical remaining on the watershed. ACTMO is composed of three submodels. The hydrology submodel uses watershed characteristics to calculate runoff, infiltration, soil moisture, etc. from weather data. The erosional submodel uses soil characteristics to compute rill and interrill erosion, deposition, and clay enrichment from runoff predictions. The chemical submodel uses information about the chemical application along with data from the other two submodels to calculate the chemical movement. The watershed is limited to an area that can be described by a single rainfall input, such as a farm-size area. (ARS)
W75-10846

AN EVALUATION OF PERSISTENCY FOR WATER BORNE ORGANICS,
Worcester Polytechnic Inst., Mass.
F. L. Hart, T. Helfgott, and R. G. Bedard.
In: 30th Annual Purdue Industrial Waste Conference, May 6-8, 1975, West Lafayette, Indiana, Purdue University, 16 p. 1 fig, 2 tab, 11 ref. OWRT A-030-CONN(7). 14-31-0001-3007.

Descriptors: *Organic compounds, Aquatic environment, *Persistance, *Biodegradation, *Oxygen demand, *Nitrogen, *Industrial wastes, *Pesticides, Laboratory tests, Organic wastes, Pollutant identification, Path of pollutants, Water pollution sources.
Identifiers: *Refactory index, Degree of degredation, Water-borne organics, Ultimate oxygen demand.

A laboratory method is discussed for designating water borne organics, from both industrial wastewaters and natural sources, according to resistance to biodegradation. Procedures and deviations are given for the parameters 'Refactory Index' which is reported as a normalized number indicating degree of degradation. Real-time parameters of oxygen demand and nitrogen are used along with slower long-term biological/biochemical measurements to formulate the refractory index values. Lists of refractory index values for common industrial organics and natural materials are offered along with a discussion as to the significance of the refractory index and its interpretation. Measurements of organic carbon, nitrates, BOD(5), and ultimate BOD per 100mg of organic compounds are also reported. Organic materials, especially those originating from industry and characterized as refractory (i.e. having refractory index values close to zero) are considered persistent for stipulated environmental conditions. This persistency is extrapolated to the bioreactors of wastewater treatment and the receiving aquatic environment. (deLara-Connecticut)
W75-10850

THE EFFECT OF THE QUANTITY OF SILT TO THE ATTACHED MICROORGANISMS OF THE KUZURYU-GAWA RIVER IN THE HOKURIKU DISTRICT, (IN JAPANESE),
Kanagawa Univ. (Japan). Biology Inst.
For primary bibliographic entry see Field 5C.
W75010696

5C. Effects Of Pollution

UTILIZATION OF A KRAFT EFFLUENT CHANNEL BY FISH AND AQUATIC ORGANISMS,
Florida Univ., Gainesville. School of Forest Resources and Conservation.
J. V. Shireman.
In: TAPPI Environmental Conference, Denver, Colorado, May 14-16, 1975, Preprinted Proceedings (TAPPI, Atlanta, Georgia), p 185-196. 7 fig, 14 ref, 3 tab.

Descriptors: *Pulp wastes, *Fish populations, *Benthic fauna, Dissolved oxygen, Sulfates, Turbidity, Hardness(Water), Chemical oxygen demand, Alkalinity, Aquatic life, Aquatic microorganisms, *Florida, Water pollution sources, Wastes, Industrial wastes, Water pollution effects, Fish types, Fish reproduction, Hydrogen ion concentration, Effluents.
Identifiers: Chronomids, Kraft mills.

Water quality parameters, fish populations, and benthic organisms were monitored from May 1974 to January 1975 in a kraft mill effluent channel of Hudson Pulp and Paper Corporation, Palatka, Florida. Dissolved oxygen in the channel ranged from 4.7 to 7.2 ppm and pH varied from 5.95 to 8.05 during the study. Sulfates and turbidity varied little and were less than 25 ppm. Total hardness, COD, and alkalinity were lowest during the summer and began to increase in September. Alkalinity and COD values continued to increase for the remainder of the study, but hardness increased

until October then dropped and leveled off from November through January. Benthic fauna consisted primarily of chronomids. The effluent channel was found to be suitable for fish habitation and growth. The most abundant species were mosquitofish, brown bullhead, white catfish, and warmouth. Bluegill, redear sunfish, golden shinner, yellow bullhead, and gizzard shad were less abundant but seemed to be permanent residents of the channel. The relative abundance of fish within the channel changed seasonally. There has been no indication of reproduction occurring in the channel, and thus recruitment must be from outside the channel. (Sykes-IPC)
W75-10377

SWIMMING PERFORMANCE OF JUVENILE COHO SALMON (ONCORHYNCHUS KISUTCH) EXPOSED TO BLEACHED KRAFT PULP MILL EFFLUENT,
B.C. Research Ltd., Vancouver. Div. of Applied Biology.
T. E. Howard.
Journal of the Fisheries Research Board of Canada, Vol 32, No 6, p 789-793, June, 1975. 13 ref. 5 tab.

Descriptors: *Salmon, *Swimming, *Performance, *Bleaching wastes, *Water pollution effects, *Pulp wastes, Wastes, Industrial wastes, Water pollution sources, Fish, Lethal limit, Aerobic treatment, Water pollution treatment, Color, Lignins, Toxicity, Pollutants, Water pollution.
Identifiers: Coho salmon(Oncorhynchus kisutch), Kraft mills.

Maximum critical swimming speeds were not achieved by fingerling coho salmon in concentrations of bleached kraft pulp mill effluent above a threshold concentration between 10-20% of the 96 hr LC(50). Reduction of swimming performance was related to effluent concentration but not to exposure time after the initial 18 hr. Swimming performance returned to control levels for fish tested in water after 6-12 hr recovery from exposure to effluent concentrations up to 0.7 LC(50). The effluent was rendered nontoxic by aerobic microbiological fermentation but some reduction in swimming performance was measured which was attributed, in part, to the effects of color and lignin materials remaining after treatment. These findings are discussed in relation to the mode of toxic action of bleached kraft mill effluents and their possible impact on aquatic ecosystems. (Witt-IPC)
W75-10387

EFFECTS OF ACUTE EXPOSURE TO BLEACHED KRAFT PULP MILL EFFLUENT ON CARBOHYDRATE METABOLISM OF JUVENILE COHO SALMON (ONCORHYNCHUS KISUTCH) DURING REST AND EXERCISE,
B. C. Research Ltd., Vancouver. Div. of Applied Biology.
D. J. McLeay, and D. A. Brown.
Journal of the Fisheries Research Board of Canada, Vol 32, No 6, p 753-760, June, 1975. 2 fig, 42 ref.

Descriptors: *Salmon, *Carbohydrates, *Metabolism, *Water pollution effects, Wastes, Industrial wastes, Water pollution sources, Fish, Lethal limit, Toxins, Aquatic animals, Water pollution, Swimming, Biochemistry.
Identifiers: Coho salmon, Liver, Glycogen, Plasma, Glucose, Muscle, Blood sugar.

In the static study (no exercise), liver glycogen stores were unchanged during 12 hr exposure to 0.8 of the 96 hr LC(50); longer exposures caused a progressive decrease to levels one-fifth those of controls at 72 hr. Plasma glucose levels in fish held in 0.8 LC(50) effluent for 3-96 hr were elevated; at 96 hr, glucose had increased three-fold. Mean values for plasma lactate were elevated at 3, 6, 24, 72, and 96 hr. In the exercise (swimming one body length/second)-rest study, muscle glycogen levels decreased 53-78% during exercise in water or effluent (0.7 LC(50) for 4-12 hr, and did not recover during 12 hr rest in water. Muscle glycogen for fish exercised for 12 hr in effluent and then rested for 4-12 hr in effluent was lower compared to values for fish exercised in effluent and then rested in water. There was no difference in liver glycogen levels of fish exercised in effluent or water for 4-12 hr. Values of liver glycogen for fish exercised in effluent for 12 hr and then rested for 4, 8, or 12 hr in effluent decreased 60-70% compared to fish exercised in water for 12 hr and then rested in water and by 55-65% from fish exercised in effluent for 12 hr and rested in water for 4-12 hr. Plasma glucose levels were elevated one- to four-fold during exercise in water or effluent. Fish resting in water for 4, 8, or 12 hr following exercise in water had relatively stable glucose levels; whereas for fish exercised and then rested in effluent the glucose levels increased two-fold during resting. Plasma lactate levels were elevated five- to six-fold during exercise in water or effluent for 4-12 hr, declining to values 1-2 times those of stock fish within 4 hr rest. Plasma lactate levels for fish exercised in effluent and then rested in effluent or water were higher than those for fish exercised and rested in water. (Witt-IPC)
W75-10388

TOXICITY OF PULPING WASTES TO FISH,
Institute of Paper Chemistry, Appleton, Wis.
J. Weiner.
Bibliographic Series No. 265, 1975. 67 p, 214 ref.

Descriptors: *Bibliographies, *Pulp wastes, *Toxicity, *Fish, Aquatic animals, Aquatic microorganisms, Bleaching wastes, Industrial wastes, Wastes, Water pollution sources, *Water pollution effects, *Toxins, Pollutants, Water pollution.

This annotated and indexed bibliography deals with the lethal and sublethal effects of pulp mill effluents (including bleach plant discharges) on fish and related aquatic organisms and covers the literature from about 1930 through 1974. (Brown-IPC)
W75-10403

ENVIRONMENTAL LIMITATIONS ON THE MICROBIAL DEGRADATION OF HYDROCARBONS IN TEMPERATE LAKES,
Wisconsin Univ., Madison. Dept. of Bacteriology.
D. M. Ward, and T. D. Brock.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 095, $5.25 in paper copy, $2.25 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report, June 1975. 103 p, 16 fig, 5 tab. OWRT A-054-WIS(2). 14-31-0001-4050, 14-31-0001-5050.

Descriptors: *Microbial degradation, Organic compounds, *Biodegradation, Nutrients, *Nitrogen, *Oil pollution, *Phosphorus, *Wisconsin, Lakes, *Bacteria, Inhibition, Oxidation, Water pollution effects.
Identifiers: *Limiting nutrients, Heterotrophic bacteria.

Nutritionally versatile heterotrophic bacteria inhabit lakes and develop in response to hydrocarbon introduction. However, the response of naturally-occurring oil-degrading microorganisms depends on environmental conditions within a lake. The rate of hydrocarbon biodegradation varied seasonally in Lake Mendota because of temperature limitation in spring and fall and nutrient limitation in mid-summer, and was optimal for only one month during the year. Nutrient limitation was also observed in lakes of varying nutrient content in Vilas County. Relationships between hydrocarbon oxidation rates and temperature or nutrient levels were shown by correlation and experimentally, and optimum conditions established. Hexadecane oxidation was inhibited in lake water and sediment samples incubated anaerobically. Acetate inhibition was indirectly caused by depletion of nitrogen and phosphorus by acetate-oxidizing bacteria. Glucose inhibition occurred in the presence of excess nitrogen and phosphorus and may result from regulatory interference such as catabolite repression. The presence of oil-degrading bacteria does not ensure rapid removal of oil pollutants in temperate lakes where environmental conditions usually limit hydrocarbon biodegradation.
W75-10407

EFFECT OF A MIXTURE OF SUCCINIC ACID MONO-SULPHO-ESTER AND OLEFIN SULFONATE ON FISH (UBER DIE WIRKUNG EINER MISCHUNG VON SULFOBERNSTEINSAURE-HALBESTER UND OLEFINSULFONAT AUF FISCHE),
Bundesforschungsanstalt fuer Fischerei, Hamburg (West Germany). Institut fuer Kuesten- und Binnen-fischerei.
H. Mann, and H. Stache.
Archiv fur Fischerei Wissenschaft, Vol 25, No 1/2, p 53-56; September 1974. 1 fig, 1 tab, 2 ref. (English abstract).

Descriptors: *Fish, *Rainbow trout, *Salmonids, *Sulfur compounds, *Organic compounds, *Toxicity, Lethal limit, Laboratory tests, Fish physiology, Water pollution effects, Biodegradation.
Identifiers: *Golden ide, *Leuciscus idus melanotus, *Succinic acid mono-sulpho-ester, *Olefin sulfonate, *Bioaccumulation.

The effect of a mixture of succinic acid mono-sulpho-ester and olefin sulfonate on golden ide (Leuciscus idus melanotus) and rainbow trout (Salmo gairdneri) was examined. In the case of golden ide the first losses occurred at 5 mg/l; with trout at 7.5 mg/l. These values were compared with the reduction in the surface tension of the corresponding concentrations. It was confirmed that a detrimental effect on fish is to be noticed at a reduction below 50 dyn/cm. The investigated product showed a good biodegradability. According to present investigations a detrimental effect on surface waters is not to be expected. (Katz)
W75-10409

EFFECTS OF MIREX ON THE LARVAL DEVELOPMENT OF BLUE CRAB,
Duke Univ., Durham, N.C. Dept. of Zoology.
C. G. Bookhout, and J. D. Costlow, Jr.
Water, Air and Soil Pollution, Vol 4, No 1, p 113-126, March 1975. 2 fig, 6 tab, 19 ref.

Descriptors: *Crabs, *Chlorinated hydrocarbon pesticides, *Lethal limit, *Growth stages, *Larvae, *Bioassays, Water pollution effects, Environmental effects, Toxicity, Laboratory studies, Tissue analysis, Mortality.
Identifiers: *Blue crab, Callinectes sapidus, *Mirex, Bioaccumulation, Sublethal effects.

After a 5-day period in experimental concentrations of 0.01, 0.1, 1.0 and 10.0 ppb mirex, there was differential survival in two replicate series of blue crab, (Callinectes sapidus) larvae in relation to concentration. 0.01 and 0.1 ppb mirex were sublethal concentrations and the 1.0 and 10.0 ppb mirex were acute. Differences in survival were attributed to stage and media effects. Residues of mirex in developmental stages increased with concentration, but biological magnification was greatest in larvae reared in the lowest concentration of mirex and lowest in larvae reared in the highest concentration. (Katz)
W75-10410

THE EFFECT OF DIFFERENT SALINITIES AND MANGANESE ION ON THE SURVIVAL RESPIRATION OF THE BALTIC FLOUNDER

(PLEURONECTES FLESUS TRACHURUS (DUNKER)) OF THE GULF OF RIGA,
All-Union Research Inst. of Sea Fisheries and Oceanography, Moscow (USSR).
A. F. Karpevich, and A. T. Shurin.
Journal of Icthyology, Vol 5, p 753-763, 1973. 7 fig, 4 tab, 8 ref.

Descriptors: *Salinity, *Respiration, *Metals, *Bioassay, Saline water, Metabolism, Laboratory tests, Oxygen, Mortality, Isotope studies, Environmental Effects, Growth rate, Dissolved oxygen, Temperatures, Metabolism, *Manganese, Water pollution effects.
Identifiers: Survival, *Baltic flounder, Pleuronectes flesus trachurus, Tissue analysis.

The effect of different salinities and of manganese on the survival and respiration of juvenile Baltic flounders was investigated. The overall salinity range and the lower lethal limits have been established. The fish were kept in solutions of manganese chloride prepared with natural water from the Gulf of Riga. The penetration of manganese into all the organs and body fluids of the flounder was established by the method of neutron cavitation analysis (after irradiation of tissue and organ samples of the flounders in a reactor neutron flux). Its flow is slight in weak manganese solutions (up to 7.5 mg/liter) and the flounder succeeds in eliminating excess manganese. At concentrations above 12-17 mg/1 manganese accumulates in vitally important organs (heart, liver, gonads), as a result of which metabolic processes are disturbed and the fish die. (Katz)
W75-10411

TOXIC EFFECTS OF ALIPHATIC CHLORINATED BY-PRODUCTS FROM VINYL CHLORIDE PRODUCTION ON MARINE ANIMALS,
Swedish Water and Air Pollution Research Lab., Goteborg.
R. Rosenberg, O. Grahn, and L. Johansson.
Water Research, Vol 9, No 7, p 607-612, July 1975. 9 fig, 2 tab, 11 ref.

Descriptors: *Toxicity, *Lethal limit, *Chlorination, *Bioassay, *Plastics, *Reproduction, Marine animals, *Shrimp, *Worms, *Industrial wastes, Mortality, Water pollution sources, Water pollution effects, Hatching, Byproducts.
Identifiers: Plastic by-products, Vinyl chloride, *Chlorinated hydrocarbons, Gadus morhua, Crangon crangon, EDC-tar, Polychaetes.

The acute toxic effects of chlorinated aliphatic hydrocarbons, formed as by-products from one Swedish and one Norwegian plastic production factory, were examined by experiments with cod, shrimp and a polychaete. The toxicity of 1,2-dichloroethane and a distillate with heavier compounds were also estimated. The 48-h LC50 ratio between the concentrations of a Swedish by-product, a Norwegian by-product, and dichloroethane was 1:9:34. The effects of 1,2-dichloroethane, 1,1,2-trichloroethane, and 1,1,2-trichloroethane on the reproductivity and on the survival of polychaete adults were studied. The reproductivity was affected by these components in far lower concentrations than those having acute toxicity effects on adult specimens. (Katz)
W75-10412

TOXICITY OF PHOSPHAMIDON TO AMERICAN LOBSTERS (HOMARUS AMERICANUS) HELD AT 4 AND 12C,
Fisheries Research Board of Canada, St. Andrews (New Brunswick). Biological Station.
D. W. McLeese.
Journal of the Fisheries Research Board of Canada, Vol 31, No 9, p 1556-1558, September, 1974; 1 fig, 2 tab, 9 ref.

Descriptors: *Lobsters, *Water temperature, *Pesticides, *Organophosphorus Pesticides, *Toxicity, *Lethal limit, Laboratory tests, Path of pollutants, Animal physiology, Water pollution effects.
Identifiers: LC50, LT50, *Phosphamidon, Bioaccumulation, *Fenitrothion, Running water, Static water.

The 96-h LC50 for phosphamidon for American lobsters, Homarus americanus, at 12C was 50 micrograms/liter and the lethal threshold is 18 micrograms/liter in both static and running water tests. At 4C the 96-h LC50 was 180 micrograms/liter and the lethal threshold was 18-28 micrograms/liter. Phosphamidon was 50-60 times less toxic than fenitrothion. (Katz)
W75-10413

CORTICOSTEROID CONCENTRATIONS IN SOCKEYE SALMON (ONCORHYNCHUS NERKA) EXPOSED TO LOW CONCENTRATIONS OF COPPER,
Fisheries and Marine Service, Vancouver (British Columbia). Vancouver Lab.
E. M. Donaldson, and H. M. Dye.
Journal of the Fisheries Research Board of Canada, Vol 32, No 4, p 533-539, April 1975; 2 fig, 9 tab, 14 ref.

Descriptors: *Salmonids, (Sockeye salmon, *Copper, *Copper compounds, *Bioassay, Fish Physiology, Water pollution effects, Laboratory tests, Lethal limit, Environmental effects, Pollutant identification.
Identifiers: Yearlings, *Steroids, *Corticosteroids, *Sublethal effects, Competitive protein binding, Technique, *Bioaccumulation, Stress response mechanism.

Yearling sockeye salmon (Oncorhynchus nerka) were exposed for 1-24 h to 10-7, 10-6, or 10-5 molar cupric sulphate in freshwater aquaria. Plasma cortisol, cortisone and 'total' corticosteroid concentrations were measured by a competitive protein binging technique. Cortisol, cortisone and 'total' corticosteroid levels were significantly higher than control concentrations after 1 h of exposure to 10-5 or 10-6m copper. 'Total' corticosteroid and cortisone concentrations were significantly higher than control concentrations after 2 and 4h of exposure to 10-7 m copper, respectively. Fish exposed to 10-5 copper died between 8 and 24 h. The data reflect a rapid corticosteroid stress response to lethal and sublethal concentrations of copper. The technique may be of use for rapid evaluation of effluents containing heavy metals, especially those containing a mixture of toxicants. (Katz)
W75-10415

STUDIES ON THE METABOLISM OF CHLOROPHENOLS IN FISH-I ABSORPTION AND EXCRETION OF PCP BY GOLDFISH,
Kyushv Univ., Fukuoka (Japan). Faculty of Agriculture.
K. Kobayashi, and H. Akitake.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 41, No 1, p 87-92, January 1975. 3 fig, 3 tab, 6 ref.

Descriptors: Freshwater fish, *Fish physiology, *Bioassay, *Absorption, *Organic compounds, *Lethal limit, Laboratory studies, Mortality, *Metabolism.
Identifiers: *Goldfish, Carassius auratus, Bioaccumulation, Excretion, *Pentachlorophenol(PCP), C-14 label, Adsorption rates.

At concentrations of pentachlorophenol (PCP) of 0.1, 0.2, and 0.4 ppm, the amount accumulated by goldfish, Carassius auratus increased with time. Maximum accumulation was observed in fish exposed to 0.2 ppm, giving 116 micro g-PCP/g-body weight. After 10 hr in PCP-free water only half of the original amount remained due to excretion by active elimination. PCP concentration in the fish increased by the amount expected from absorption minus that expected from excretion until 100 micro g-PCP-body weight concentration at which time mortality occured. PCP found in the fish had not undergone decomposition. (See also W75-10418) (Katz)
W75-10417

STUDIES ON THE METABOLISM OF CHLOROPHENOLS IN FISH-II TURNOVER IN ABSORBED PCP IN GOLDFISH,
Kyushu Univ., Fukuoka (Japan). Faculty of Agriculture.
K. Kobayashi, and H. Akitake.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 41, No 1, p 93-99, January 1975; 2 fig, 3 tab, 7 ref.

Descriptors: Freshwater fish, *Fish physiology, *Bioassay, *Adsorption, *Organic compounds, Tissue analysis, Membranes, Laboratory studies.
Identifiers: *Goldfish, Carassius auratus, Bioaccumulation, *Pentachlorophenol, *Gall bladder, Passive diffusion, Active elimination, Excretion.

Pentachlorophenol (PCP) absorbed by goldfish, Carassius auratus, was accumulated in various organs, especially the gall bladder. The biliary concentration of PCP reached 539 micro g/g after 24-hr exposure and showed further increase even after after fish were transferred to clean, running water for 24 hours, reaching a level of 1,077 micro g/g which accounted for 41% of the total PCP detected. A decrease in PCP level was observed for all other organs examined. The characteristic accumulation of PCP in the gall bladder indicates that fish can dispose of PCP by active elimination such as conjugation and decomposition, and passive diffusion. (See also W75-10417) (Katz)
W75-10418

MARINE POLLUTION BIOASSAY BY SEA URCHIN EGGS, AN ATTEMPT TO ENHANCE ACCURACY,
Doshisha Univ., Kyoto (Japan). Biological Lab.
For primary bibliographic entry see Field 5A.
W75-10419

UREA IN THE WATERS OF LAKE KINNERET (SEA OF GALILEE),
Kinneret Limnological Lab., Timberias (Israel).
T. Berman.
Limnology and Oceanography, Vol 19, No 6, p 977-980, 1974. 1 fig, 20 ref.

Descriptors: *Ureas, *Nitrogen compounds, *Ammonia, *Nitrogen cycle, *Photoplankton, *Zooplankton, Aquatic productivity, Ecosystems, Bacteria, Primary productivity, Eutrophication, Biomass, Algae, Limnology.
Identifiers: *Organic nitrogen, *Lake Kinneret(Sea of Galilee), Urea sources, Israel.

Urea concentrations measured in the pelagic waters of Lake Kinneret over a 12-month period varied from undetectable to maximum values of 80 and 150 micrograms N/liter, with a seasonal pattern of fluctuation. Although urea is not a major constituent of the dissolved organic nitrogen and represents a relatively low amount when compared with ammonia, it may provide a significant source of available nitrogen for lake planktonic algae and bacteria. (Katz)
W75-10420

UPTAKE OF THREE POLYCHLORINATED BIPHENYLS, DDT AND DDE BY THE GREEN SUNFISH, LEPOMIS CYANELLUS RAF.,
Illinois State Natural History Survey, Urbana.
J. R. Sanborn, W. F. Childers, and R. L. Metcalf.
Bulletin of Environmental Contamination and Toxicology, Vol 13, No 2, p 209-217, February 1975. 6 fig, 4 tab, 16 ref.

Descriptors: *Polychlorinated biphenyls, *Aroclors, *Bioassay, *DDT, *DDE, *Metabolism, *Sunfishes, Freshwater fish, Laboratory tests, Analytical techniques, Tracers, Carbon radioisotopes, Pesticide residues, Pollutants, Absorption.
Identifiers: Lepomis cyanellus, Aroclor 1242, Aroclor 1248, Aroclor 1254.

The uptake of three pure 14C PCB's, DDT and DDE by the green sunfish was investigated in order to determine the physiologic effects of these compounds and their susceptibility to metabolism. The penta chlorobiphenyl showed a similar uptake and retention curve to DDT and DDE. The tetrachlorobiphenyl disappeared from test fish more rapidly than more highly chlorinated compounds and the trichlorobiphenyl was the most susceptible to metabolism. (Katz)
W75-10422

ACUTE TOXICITY OF KANAMYCIN TO STEELHEAD TROUT (SALMO GAIRDNERI),
Fisheries and Marine Service, Vancouver (British Columbia). Vancouver Lab.
J. McBride, G. Strasdine, and U. H. M. Fargerlund.
Journal of the Fisheries Research Board of Canada, Vol 32, No 4, p 554-558, April 1975; 6 fig, 1 tab, 9 ref.

Descriptors: *Rainbow trout, *Salmonids, Trout, *Toxicity, *Mortality, *Fish diseases, Fish physiology, Fish toxins, *Growth stages, *Antibiotics, Laboratory tests, Lethal limit, Bacteria, Pseudomonas.
Identifiers: *Steelhead trout, Tissue analysis, *Kanamycin, Aeromonas, Plasma cortisol pathology.

Kanamycin adminilstration at the recommended dosage (10.0-20.0 micro g) for the treatment of fish infected with species of Aeromonas and Pseudomonas was highly toxic to steelhead trout, Salmo gairdneri. Descriptions of both gross and microscopic pathological alterations, as well as plasms cortisol concentrations were provided. (Katz)
W75-10423

EFFECTS OF METHYLMERCURY ON APPROACH AND AVOIDANCE BEHAVIOR OF MALLARD DUCKLINGS,
Bureau of Sport Fisheries and Wildlife, Laurel Md. Patuxent Wildlife Research Center.
G. Heinz.
Bulletin of Environmental Contamination and Toxicology, Vol 13, No 5, p 554-564, May 1975; 5 tab, 16 ref.

Descriptors: *Mercury, *Waterfowl, *Environmental effects, *Animal behavior, *Mallard Duck, Birds, Ducks(Wild), Laboratory tests, Heavy metals, Methodology, Analytical techniques, Water pollution effects.
Identifiers: Methylmercury dicyandiamlde.

The effect of low dietary levels of methylmercury dicyandiamide fed to mallard ducks on approach and avoidance behavior of their offspring was investigated. The ducks were fed a control diet or a diet of 0.5 or 3 ppm mercury. The approach behavior, in response to a tape-recorded maternal call, and avoidance of a frightening stimulus were measured. There were no significant differences among ducklings in the percentage that approached the tape-recorded maternal call. Ducklings from parents fed the diet containing mercury were hypersensitive in the test of avoidance of a frightening stimulus. (Katz)
W75-10424

EFFECT OF THE INSECTICIDE ZECTRAN (MEXACARBATE) ON SEVERAL ALGAE,
Montana Univ., Missoula. Dept. of Botany.
R. P. Sheridan, and M. A. Simms.
Bulletin of Environmental Contamination and Toxicology, Vol 13, No 5, p 565-569, May, 1975. 2 fig, 10 ref.

Descriptors: *Algae, *Insecticides, *Oxygen, *Respiration, *Photosynthesis, Laboratory tests, Primary productivity, Toxicity, Growth rate, Water pollution effects.
Identifiers: *Zectran.

Field samples of freshwater algae were examined to determine the effect of the insecticide Zectran on-photosynthesis rate. Concentrations of Zectran between 10 and 103 ppb affected neither oxygen production nor NaH14 CO3 uptake in any of the seven genera tested. However, Zectran at a concentration of 104 ppb after 1 hour effected a reduction in photosynthesis of Chroococcus, Oedogonium and in a mixed sample of Zygnema, Mougeotia and Spirogyra. Mougeotia, Spirogyra and Schizoonium were not affected by exposure to 104 ppb Zectran after an hour, but oxygen production was significantly reduced after 24 hours of exposure to this same concentration. (Katz)
W75-10425

CRITICAL THERMAL MAXIMA OF THREE SPECIES OF HAWAIIAN ESTUARINE FISH: A COMPARATIVE STUDY,
Oceanic Inst., Waimanalo, Hawaii.
J. R. Sylvester.
Journal of Fish Biology, Vol 7, No 2, p 257-262, 1975. 2 fig, 1 tab, 18 ref.

Descriptors: *Temperature, *Estuaries, *Fish, *Hawaii, Time, Thermal stress, Fish physiology, Seasonal, Laboratory tests, Brackish-water fish.
Identifiers: *Mugil cephalus, *Chelon engeli, *Kuhlia sandvicensis, Critical thermal maxima, Acclimation.

Critical thermal maxima of three species of Hawaiian estuarine fishes were determined in relation to acclimation temperature and time of day. The species studied were Mugil cephalus, Chelon engeli, and Kuhlia sandvicensis. Critical thermal maxima of all three species were significantly affected by acclimation temperature and time. In relation to acclimation temperature, M. cephalus and C. engeli have similar critical thermal maxima with K. sandvicensis having a critical thermal maxima about 1 degree C. lower than that of the two other species. Mugil cephalus and Chelon engeli showed an increasing critical thermal maxima toward midday which decreased thereafter. OCritical thermal maximum of Kuhlia sandvicensis increased throughout the day. (Katz)
W75-10426

EFFECTS OF HEAVY METALS AND PESTICIDES ON THE MASS MORTALITIES OF CULTURED SHELLFISHES ALONG THE SOUTHWEST COAST OF TAIWAN, (IN CHINESE),
Academia Sinica, Taipei (Taiwan). Inst. of Zoology.
S. S. Jeng, Y. W. Huang, J. L. Lain, L. T. Sun, and G. S. Wang.
Journal of the Fisheries Society of Taiwan, Vol 3, No 2, p 35-39, 1974. 3 fig, 15 ref. English abstract.

Descriptors: *Heavy metals, *Pesticides, *Chlorinated hydrocarbon pesticides, *Mortality, *Water pollution effects, *Oysters, *Bioassay, *Commercial Shellfish, DDT, Dieldrin, Mercury, Lead, Cadmium, Zinc, Nickel, Arsenic compounds, Population, Sampling, Environmental effects.
Identifiers: Tissue analysis, Bioaccumulation, BHC, *Taiwan.

Oysters reared along the southwest coast of Taiwan were sampled monthly for one year for heavy metals and organochlorine pesticides analyses. During their 'danger season', April, both dead and live oysters were analyzed. Results showed that heavy metal contents in the oysters were normal throughout the year and during the 'danger season', and were close to ordinary levels in the dead oysters. No aldrin, endrin, or heptachlor expoxide were detected and only small amounts of DDT, BHC, and dieldrin were present. It was suggested that large-scale death of the shellfish was not directly related to heavy metals and organochlorine pesticides. (Katz)
W75-10427

THE EFFECTS OF CRUDE OIL ON THE PALATABILITY OF MARINE CRUSTACEANS,
Louisiana State Univ., Baton Rouge. School of Forestry and Wildlife Management.
L. H. Knieper, and D. D. Culley, Jr.
The Progressive Fish-Culturist, Vol 37, No 1, p 9-14, January 1975. 3 fig, 2 tab, 18 ref.

Descriptors: *Organoleptic properties, *Crude oil, *Crustaceans, *Commercial shellfish, Shrimp, Crabs, Absorption, Water quality control, Water pollution effects, Lethal limit.
Identifiers: *Sublethal effects, Panaeus ssp., Callinectes sapidus, Taste tests.

The palatability of Panaeus aztecus, P. setiferus and Calliniectes sapidus was investigated after exposure to sublethal doses of various crude oils. The threshold level for identification of an oily taste on shrimp and crab was determined by a taste panel. Threshold levels varied according to species and oil. They ranged from 49 ppm in P. setiferus to 1,250 ppm in the crab. (Katz)
W75-10428

DDT : SHORT TERM EFFECTS ON OSMOREGULATION IN BLACK SURFPERCH (EMBIOTOCA JACKSONI),
University of Southern California, Los Angeles. Dept. of Biological Sciences.
J. P. Waggoner, and M. G. Zeeman.
Bulletin of Environmental Contamination and Toxicology, Vol 13, No 3, p 297-300, March 1975. 1 tab, 11 ref.

Descriptors: *Toxicity, *Perches, *DDT, Osmosis, *Permeability, Membrane processes, *Fish physiology, *Bioassay, *Teleosts, Chlorinated hydrocarbon pesticides, Environmental effects, Water pollution effects, Methodology, Mortality.
Identifiers: *Black surfperch, *Osmoregulation, Embiotoca jacksoni.

The effects of DDT on osmoregulation in a marine teleost and the ability of this osmoregulatory failure to cause death were investigated. A DDT suspension was injected intraperitoneally into black surfperch. Plasma osmotic concentration increased substantially only at doses much larger than are likely to be encountered in nature. Death of marine telecosts from DDT poisoning probably involves factors other than osmoregulatory failure. (Katz)
W75-10429

HEAVY METAL CONTENTS OF FISHES CAUGHT IN KAOHSIUNG HARBOR, (IN CHINESE),
National Taiwan Univ., Taipei. Inst. of Oceanography.
For primary bibliographic entry see Field 5A.
W75-10430

TEMPERATURE-INDUCED CHANGES IN ACUTE TOXICITY OF ZINC TO ATLANTIC SALMON (SALMO SALAR),
Guelph Univ. (Ontario). Dept. of Zoology.
P. V. Hodson, and J. B. Sprague.
Journal of the Fisheries Research Board of Canada, Vol 32, No 1, p 1-9, January 1975. 2 fig, 3 tab, 26 ref.

Descriptors: *Atlantic salmon, *Salmonids, *Lethal limit, *Zinc, *Water pollution effects, *Toxicity, *Water temperature, Metals, Laboratory studies, Seasonal, Winter, Fish populations, Copper, Equation, Bioassay, Fish physiology, Environmental effects, Mortality, *Canada.
Identifiers: *LC50, Acclimation, Continuous-flow, Bioaccumulation, Parr, *Miramichi River(New Brunswick).

Three groups of Atlantic salmon (Salmo salar) parr were acclimated to water temperatures of 3, 11, and 19C and then exposed to lethal concentrations of zinc. The cold-acclimated salmon survived longer than warm-acclimated salmon, although the threshold LC50 of zinc was highest for salmon at 19C. An equation to predict the threshold LC50 was given. In polluted rivers, zinc concentrations were suggested to be most damaging to fish populations during the winter months. Measured concentrations of zinc and copper in the Miramichi River, New Brunswick, were highest in winter when estimated toxicity was also greatest. (Katz)
W75-10431

BIOASSAY DATA FOR MARINE POLLUTION USING SEA URCHIN EGGS, 1972 AND 1973,
Doshisha Univ., Kyoto (Japan). Biological Lab.
For primary bibliographic entry see Field 5A.
W75-10432

DECREASE OF NET CARBON FLUX IN TWO SPECIES OF MUSSELS CAUSED BY EXTRACTS OF CRUDE OIL,
Massachusetts Univ., Gloucester. Marine Station.
E. S. Gilfillan.
Marine Biology, Vol 29, No 1, p 53-57, 1975. 6 fig, 10 ref.

Descriptors: *Mussels, *Salinity, *Oil, *Carbon cycle, *Metabolism, *Stress, Water pollution effects, Laboratory tests, Toxicity, Water pollution sources, Crustaceans.
Identifiers: Mytilus edulis, Modiolus demissus, Crude oil, *Carbon flux.

Effects of crude oil and salinity on the metabolism of two common filter-feeding animals (Mytilus edulis and Modiolus demissus) have been investigated. Carbon budgets have been calculated for each species under a variety of combinations of oil content and salinity. Both reduced salinity and the presence of crude oil tend to decrease the net carbon flux for each species; stresses from each source interacted in their effects on experimental animals. Although similar responses to oil were shown by each species, Mytilus edulis appeared to be slightly more resistant to oil than Modiolus demissus. (Katz)
W75-10433

TOXIC EFFECTS OF AN ANIONIC DETERGENT ON THE GILLS OF RAINBOW TROUT,
Aston Univ., Birmingham (England). Dept. of Biological Sciences.
P. D. Abel, and J. F. Skidmore.
Water Research, Vol 9, No 8, p 759-765, August 1975. 12 fig, 1 tab, 23 ref.

Descriptors: *Salmonids, *Rainbow trout, *Fish physiology, *Organophosphorus compounds, *Water pollution effects, *Toxicity, *Detergents, Laboratory tests, Lethal limit, Path of pollutants.
Identifiers: Tissue analysis, Bioaccumulation, Sodium lauryl sulphate, Gills, LT50, Sublethal limit, Osmoregulation, Hypoxia.

The changes that occurred in the gill tissue of rainbow trout, Salmo gairdneri, exposed to 100 mg/l sodium lauryl sulphate were similar to those induced by other toxic agents. The gill epithelium lifted away from the underlying tissue, and lymphocytes and granulocytes invaded the subepithelial spaces. Detailed changes at the cellular level, mostly related to cell death, distinguished SLS-induced damage from that caused by zinc sulphate. Epithelial lifting was suggested to be a consequence of a decrease in gill surface area imposed by the need to maintain osmotic stability while sustaining the progressive loss of epithelial cells caused by pollutant action. (Katz)
W75-10434

EFFECTS OF THE INSECTICIDE SEVIN AND ITS FIRST HYDROLYTIC PRODUCT, 1-NAPTHOL, ON SOME EARLY DEVELOPMENTAL STAGES OF THE BAY MUSSEL, MYTILUS EDULIS,
Oregon State Univ., Newport. Dept. of Fisheries and Wildlife.
D. A. Armstrong, and R. E. Millemann.
Marine Biology, Vol 28, No 1, p 11-15, 1974. 1 fig, 2 tab, 16 ref.

Descriptors: *Bioassay, *Pesticides, *Growth stages, *Larval growth stage, Mussels, Toxicants, Bioindicators, Environmental effects, Water pollution effects.
Identifiers: *Mytilus edulis, Growth anomalies, Sublethal effects, EC50, *Sevin, 1-napthol.

Six developmental stages of the bay mussel Mytilus edulis from fertilization to 32 h after fertilization, and also unfertilized eggs, were exposed for 1 hr to different concentrations of the insecticide Sevin and its first hydrolytic product, 1-napthol. After exposure, the larvae or eggs were separated from the pesticide solution and returned to clean water. At 48 h after fertilization, the numbers of normal and abnormal larvae were determined and 1-h EC50 values (the effective concentrations that caused anomalous development of 50% of the test animals) were calculated. The most sensitive developmental stage was the one that occurred shortly after fertilization at the time of appearance of the first polar body. Thereafter, sensitivity decreased as age increased. The EC50 of Sevin for the first polar body stage and the 32-h stage were 5.3 and 24.0 mg/l of Sevin, respectively. The EC50 of 1-napthol for the first polar body stage was 5.2 mg/l. Effects of the toxicants on development were characterized by the disjunction of blastomeres, a reduction in the rate of development, and asynchronous and unaligned cleavages. (Katz)
W75-10435

THE EFFECTS OF A NO. 2 FUEL OIL AND TWO CRUDE OILS ON THE GROWTH AND PHOTOSYNTHESIS OF MICROALGAE,
Texas Univ., Port Aransas. Inst. of Marine Science.
W. M. Pulich, Jr., K. Winters, and C. Van Baalen.
Marine Biology, Vol 28, No 2, p 87-94, 1974. 3 fig, 5 tab, 10 ref.

Descriptors: *Oil, *Algae, *Growth rate, *Photosynthesis, *Sea water, *Toxicity, *Bioassay, Environmental effects, Analytical techniques, Toxicants, Diatoms, Dinoflagellates, Cyanophyta, Chlorophyta.
Identifiers: *Thalassiosira pseudonana, Crude oils, Microalgae, No 2 fuel oil.

Seawater, when equilibrated with a sample of No. 2 fuel oil, becomes toxic in varying degrees to growth of representative types of micro-algae, two blue-greens, a diatom, two greens and a dinoflagellate. For Thalassiosira pseudonana, a sensitive organism, if the toxic materials constitute 1-10% of the sample, 40-400 ppb is lethal. Growth and photosynthesis in other algae were affected at higher concentrations of oil-equilibrated seawater. Water solubles from Kuwait or Southern Louisiana crude oils were not toxic, however specific fractions obtained by distillation did show some water soluble toxicity. The growth of most organisms was inhibited by direct contact with these two crude oils. With both the seawater equilibrated with fuel oil and the crude oils, the toxic activity is mainly localized in medium and higher boiling fractions derived from distillation cuts from these materials. (Katz)
W75-10436

THE BIOLOGICAL HALF-LIFE OF INORGANIC MERCURY IN THE DUNGENESS CRAB (CANCER MAGISTER),
Fisheries and Marine Service, West Vancouver (British Columbia). Pacific Environment Inst.
J. P. Sloan, J. A. J. Thompson, and P. A. Larkin.
Journal of the Fisheries Research Board of Canada, Vol 31, No 10, p 1571-1576, October 1974. 2 fig, 5 tab, 9 ref.

Descriptors: *Crabs, *Mercury, *Computer programs, Equations, *Commercial shellfish, Laboratory studies, Animal physiology, Water pollution effects.
Identifiers: *Dungeness crab, Cancer magister, *Biological half life, Tissue analysis.

Experimental data indicated that inorganic mercury has a biological retention time of 20-25 days in the Dungeness crab (Cancer magister). Three theoretical models to explain the mode of elimination were tested by computer program. The validity of the widely used negative exponential 'biological half-life' is left in some doubt from the results obtained. (Katz)
W75-10437

TOXICITY OF TWO SYNTHETIC PYRETHRINS TO BROWN TROUT,
New York State Dept. of Environmental Conservation, Albany.
J. C. Skea, H. J. Dean, C. Talbot, and C. N. Frisa.
New York Fish and Game Journal, Vol 22, No 1, p 62-67, January 1975. 2 fig, 3 tab, 6 ref.

Descriptors: *Toxicity, *Insecticides, *Lethal limit, *Bioassay, *Brown trout, *Fingerlings, *Environmental effects, Salmonids, Laboratory studies, Dissolved oxygen, Organic pesticides, Water pollution effects.
Identifiers: *Pyrethrins, LD50 values, Survival rates.

The toxicity of two synthetic pyrethrins, SBP 1382 EC (24.3 per cent active ingredient) and Formula 7067 (5 percent active ingredient) was determined for fingerling brown trout. By bioassay, it was found that the 24-hour TLm for SBP 1382 EC was approximately 1.2 micrograms per liter and that the 24-hour and 48-hour TLm for Formula 7067 were 4.9 and 3.5 micrograms per liter, respectively. Data also indicated that there was a breakdown of SBP 1382 EC when mixed with acetone in stock solutions and kept for more than 24 hours. (Katz)
W75-10438

TOXICITY OF PAIRED MIXTURES OF CANDIDATE FOREST INSECTICIDES TO RAINBOW TROUT,
Bureau of Sport Fisheries and Wildlife, La Crosse, Wis. Fish Control Lab.
L. L. Marking, and W. L. Mauck.
Bulletin of Environmental Contamination and Toxicology, Vol 13, No 5, p 518-523, May 1975. 1 tab, 19 ref.

Descriptors: *Toxicity, *Organophosphorus compounds, *Insecticides, *Rainbow trout, *Bioassay, Pesticides, Fish, Laboratory tests, Phosphorous compounds, Lethal limit, Carbamate pesticides, Forestry, Water pollution effects.
Identifiers: *Synergistic effects, *Additive index, Forest insects.

Seven forest insecticides were tested individually and in paired mixtures against rainbow trout. The carbamate zectran was the least toxic, and the synthetic pyrethroids were the most toxic. Nine of the mixtures produced less than additive toxicity, nine produced additive toxicity and two produced greater than additive toxicity (synergism). None of

the mixture toxicities deviated markedly from additive, and only two pairs of mixtures would pose a greater toxicological hazard to fish than the individual chemicals. (Katz)
W75-10439

RESPONSE OF FRESHWATER PROTOZOAN ARTIFICIAL COMMUNITIES TO METALS,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
J. A. Ruthven, and J. Cairns, Jr.
Journal of Protozoology, Vol 20, No 1, p 127-135, 1973, Illus.

Descriptors: *Protozoa, Metals, *Zinc, *Copper, Toxicity, Water pollution effects, Daphnia, Heavy metals.
Identifiers: Amoeba-proteus, Blepharisma, Chaos-carolinensis, Chilomonas-paramecium, Chlamydomonas-reinhardtii, Euglena-acus, Euglena-gracilis, Paramecium-caudatum, Paramecium-multimicronucleatum, Peranema-trichophorum, Stentor-coeruleus, Tetrahymena-pyriformis.

An artificial freshwater protozoan (Chilomonas paramecium, Tetrahymena pyriformis, Peranema trichophorum, Euglena gracilis, E. acus, Paramecium multimicronucleatum, P. caudatum, Blepharisma, Chlamydomonas reinhardi, Amoeba proteus, Stentor coeruleus, Chaos carolinensis) community was subjected to different concentrations of Zn and Cu in a test system consisting of Plexiglas troughs through which pond water flowed continuously. Although the percent survival of colonizing species exposed to Cu or Zn fluctuated greatly at each concentration, the range of toxicity for each compound allowed comparison of protozoa with other organisms with respect to resistance to heavy metal toxicity. Individual protozoan species also were exposed for 3 hr to Zn, Cu, Cr, phenol Pb, Mn, Co, HNO3, acetic acid, Al, Sn, and HCl to derive time to death curves. Protozoa tested appeared to be more resistant than Daphnia to phenol, K2Cr2O7, and Cu; however, some species were more sensitive than Daphnia, to Zn, nitric acid, and HCl. This suggests that the sensitivity of protozoa to toxicants may be either more or less than that of macroinvertebrates and that information does not suffice to predict sensitivity. Moreover, the relative sensitivity of protozoa to various toxicants will not always be the same, i.e., species X may be twice as tolerant to a toxicant as species Y, but its relative sensitivity may be quite different for another toxicant.--Copyright 1973, Biological Abstracts, Inc.
W75-10440

EXPERIMENTAL INVESTIGATION ON THE BIOLOGICAL CONCENTRATION OF MERCURY-I. ON THE RATE OF MERCURY TRANSFER THROUGH THE FOOD CHAIN FROM JACK MACKEREL TO YOUNG YELLOWTAIL (IN JAPANESE),
Aichi Prefecture Fisheries Experimental Station, Miya (Japan).
T. Suzuki, and M. Hatanaka.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 40, No 11, p 1173-1178, November 1974. 2 fig, 4 tab, 10 ref.

Descriptors: Fish, *Marine fish, *Food chains, *Food webs, *Mercury, *Path of pollutants, Metals, Seawater, Environmental effects, Growth rates, Life cycles, Water pollution effects.
Identifiers: Bioaccumulation, *Yellowtail, Trachrus japonicus, Seriola quinqueradiata, *Jack mackerel, *Methyl mercury, Tissue analysis.

After being reared in methylmercury dosed seawater, jack mackerels, Trachrus japonicus, were fed to tagged yellowtail, Seriola quinqueradiata, for 18 days maintaining normal feeding and growth rate. The total amount of mercury incorporated by the yellowtail was determined on the basis of body weight and amount of mercury of the jack mackerels. The rate of mercury transfer, 66% to 130% (average-88%) was calculated from the remaining mercury in the yellowtail and the total. The food chain was suggested to play a significant role in the biological concentration of mercury. (Katz)
W75-10441

ANALYSIS OF TRI-ARYL PHOSPHATE ESTERS AND THE DETERMINATION OF IMOL S-140 IN FISH TISSUE AND WATER SAMPLES BY GAS CHROMATOGRAPHY,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5A.
W75-10442

EFFECT OF WATER HARDNESS ON THE TOXICITY OF A NONIONIC DETERGENT TO FISH,
Unilever Ltd., Sharnbrook (England). Unilever Research Lab.
P. W. A. Tovell, C. Newsome, and D. Howes.
Water Research, Vol 9, No 1, p 31-36, January 1975. 8 tab, 7 ref.

Descriptors: *Toxicity, *Detergents, *Hardness(Water), *Rainbow trout, *Bioassay, *Absorption, Laboratory tests, Methodology, Domestic wastes, Carbon radioisotopes, Water pollution effects.
Identifiers: *Carassius auratus, *Ethoxylate detergents.

Trout and goldfish were placed in treatment solutions of different water hardnesses containing ethoxylate (EO) detergents. Survival times were recorded. 14C-labelled EO was used to assess absorption. The toxicity of ethoxylates to fish acclimatized and treated in different water hardnesses, and the effect of cations on ethoxylate toxicity were also investigated. EO is slightly less toxic in hard water than in soft water. The hardness of the treatment solution has no marked influence on the amount of EO absorbed by the fish. Evidence suggests that there is little relationship between the composition of cations constituting a particular hardness and the toxicity of EO. Acclimatization in different water hardnesses does not affect the susceptibility of fish to nonionic ethoxylate detergents. (Katz)
W75-10444

SOME OBSERVATIONS ON SPAWNING OF BROOK TROUT (SALVELINUS FONTINALIS MITCHILL) IN LIME NEUTRALIZED IRON HYDROXIDE SUSPENSIONS,
Pittsburgh Univ., Pa. Graduate School of Public Health.
J. L. Sykora, E. J. Smith, M. Synak, and M. A. Shapiro.
Water Research, Vol 9, No 4, p 451-458, April 1975. 1 fig, 8 tab, 12 ref.

Descriptors: *Spawning, *Neutralization, *Iron oxides, *Lime, *Acid mine water, *Fish eggs, Hatchability, *Brook trout, *Iron, *Reproduction, Laboratory tests, Environmental effects, Water quality, Growth rates, Mortality, Temperature, Fish behavior, Metals, Alkalis(Bases), Acid-Base Equilibrium.
Identifiers: Salvelinus fontinalis, Sublethal effects, Suspended iron.

The long-term effect of lime neutralized suspended iron on brook trout spawning and egg hatchability was assessed in a flow-through environment with a modified proportional diluter. Results of a two-year study reveal low survival of maturing fish and a decline in egg production at higher suspended iron concentrations. Brook trout egg hatchability was unaffected in concentrations of lime neutralized iron hydroxide ranging from 0.75 to 12 mg Fe/l. A comparison of data on survival, growth, and egg hatchability indicates that the safe level of lime neutralized iron suspensions for brook trout in an enclosed, intermittent-flow testing system presumably lies between 7.5 and 12.5 mg Fe/l. (Katz)
W75-10445

THE EFFECT OF HEAVY METALS ON PHOTOSYNTHESIS AND LOSS OF CELL POTASSIUM IN TWO SPECIES OF MARINE ALGAE, DUNALIELLA TERTIOLECTA AND PHAEODACTYLUM TRICORNUTUM,
Institute of Marine Biochemistry, Aberdeen (Scotland).
J. Overnell.
Marine Biology, Vol 29, No 1, p 99-103, 1975. 3 fig, 15 ref.

Descriptors: *Diatoms, *Heavy metals, *Potassium, *Photosynthesis, *Marine algae, *Algae, *Permeability, Oxygen, Zinc, Cadmium, Lead, Copper, Laboratory tests, Inhibition, Mercury respiration, Water pollution effects.
Identifiers: *Dunaliella tertiolecta, *Phaeodactylum tricornutum, DCMU, Oxygen evolution, Potassium.

The effects of various heavy metals on light-induced oxygen evolution and on net potassium release were studied in short-term experiments using the unicellular marine algae Dunaliella tertiolecta and Phaeodactylum tricornutum. Heavy metals, except for copper and 3, (3,4-dichlorophenol)-1, 1-dimethyl urea (DCMU) did not cause loss of potassium at concentrations similar to or less than those required for inhibition of photosynthesis. At the concentrations used, no significant loss of potassium was observed for Zn2+, Cd2+, Tl+, Pb2+, or DCMU. With Cu2+, potassium release occurred at a marginally lower concentration than did inhibition of photosynthesis. No extreme sensitivity of light-induced oxygen evolution to inhibition by cadmium and lead was observed. (Katz)
W75-10447

THE EFFECT OF TEMPERATURE AND SALINITY ON CADMIUM UPTAKE BY THE BLUE CRAB, CALLINECTES SAPIDUS,
South Carolina Univ., Columbia. Dept. of Biology.
M. S. Hutcheson.
Chesapeake Science, Vol 15, No 4, p 237-241, December 1974. 3 fig, 3 tab, 17 ref.

Descriptors: *Cadmium, *Salinity, *Crabs, *Temperature, *Absorption, Commercial shellfish, Shellfish, Pollutants, Wastes, Metals, Estuaries, Statistical methods, Stress, Water pollution effects.
Identifiers: Callinectes sapidus, Tissue analysis, Bioaccumulation, *Blue crabs.

Adult blue crabs were exposed to various concentrations of cadmium in sea water at different thermosaline regimes. Concentration and rates of uptake of cadmium were greatest at low salinities and higher temperatures with major sites of localization in gill, hepatopancreas and carapace. Claw muscle was comparatively low in cadmium. (Katz)
W75-10448

THALLIUM: OCCURRENCE IN THE ENVIRONMENT AND TOXICITY TO FISH,
Fisheries Research Board of Canada, St. Andrews (New Brunswick). Biological Station.
V. Zitko, W. V. Carson, and W. G. Carson.
Bulletin of Environmental Contamination and Toxicology, Vol 13, No 1, p 23-30, January 1975. 1 fig, 3 tab, 20 ref.

Descriptors: *Toxicity, *Bioassay, *Algae, *Mine wastes, *Heavy metals, Hardness(Water), Industrial wastes, Mine water, Water pollution sources, Atlantic salmon, Lethal limit, Analytical techniques, Copper, Water pollution effects.
Identifiers: *Thallium.

Thallium is present in the effluents of the base-metal mining industry, and its acute toxicity to juvenile Atlantic salmon is approximately equal to that of copper. The usual treatment of waste water with alkali to remove heavy metals by precipitation has little effect on thallium. The limited use of thallium will not lead to a global contamination of the environment, but localized problems may exist or develop in the future as a result of mineral processing. (Katz)
W75-10449

EFFECTS OF PH ON TOXICITY OF ANTIMYCIN TO FISH,
Bureau of Sport Fisheries and Wildlife, La Crosse, Wis. Fish Control Lab.
L. L. Marking.
Journal of the Fisheries Research Board of Canada, Vol 32, No 6, p 769-773, June 1975. 3 fig, 3 tab, 13 ref.

Descriptors: *Antibiotics(Pesticides), *Fish control agents, *Piscicides, *Organic compounds, *Hydrogen ion concentration, *Hardness(Water), *Carp, *Sunfishes, *Toxicity, Lethal limit, Mortality, Laboratory tests, Water pollution effects.
Identifiers: *Antimycin, *Detoxification, Cyprinus carpio, Green sunfishes, Bluegill sunfishes, Lepomis cyanellus, Lepomis macrochirus, Survival rates.

Detoxification of antimycin at pH 9.5 was caused by two factors. The piscicide was biologically unavailable at the high pH, and this unavailability was reversed by decreasing the pH of water solutions. Simultaneously antimycin detoxified with time, and the resulting loss in toxicity was irreversible. The toxicity of antimycin was related to the amount of un-ionized molecules; however, the dissociation curve resulting from the published pKa of 5.1 does not agree with the implied dissociation when based on toxicity. Toxicity of antimycin decreased gradually from pH 6.5 to 8.5 and abruptly from 8.5 to 9.5 with carp (Cyrpinus carpio), green sunfish (Lepomis cyanellus), and bluegill (Lepomis macrochirus). As previously suggested, water hardness had little or no effect on toxicity. (Katz)
W75-10450

EVALUATION OF THREE SIDE CHANNELS AND THE MAIN CHANNEL BORDER OF THE MIDDLE MISSISSIPPI RIVER AS FISH HABITAT,
Missouri Department of Conservation, Jefferson City.
D. V. Ragland.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-786 142, $4.25 in paper copy, $2.25 in microfiche. Prepared under contract for the U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, March 1974. 62 p, 2 fig, 15 tab, 36 ref.

Descriptors: *Ecosystems, *Food webs, *Habitats, *Food chains, *Biological communities, *Mississippi River, *Channels, *Benthos, *Plankton, River systems, Fish, Water quality, Minnows, Bluegill, Carp, Buffalo fish, Bass, Turbidity, Hydrogen ion concentration, Temperature, Water pollution effects.

The importance of side channels and main channel borders as fish habitat was evaluated in three representative areas of the Middle Mississippi River. Fish, benthos and plankton were collected in seasonal samples in 1972-73. Water quality was measured. Zooplankton occurred in greater numbers in side channels than in main channel border areas, but no significant differences were detected in phytoplankton numbers between the two habitat types. Benthic organisms generally occurred in greater numbers in the main channel border habitat. Minnows and small fish were nearly 6 times more abundant in seine collections from the side channels than in main channel borders. Both the side channels and main channel border areas were important as fish habitat. (Katz)
W75-10451

OCEAN POLLUTANTS POSE POTENTIAL DANGER TO MAN,
For primary bibliographic entry see Field 5B.
W75-10464

INTERNATIONAL EXPLORATION LOCATES MINERALS AND OILS,
National Science Foundation, Washington, D.C. Office for the International Decade of Ocean Exploration.
For primary bibliographic entry see Field 5B.
W75-10467

TAR POLLUTION OF SIERRA LEONE BEACHES,
Fourah Bay Coll., Freetown (Sierra Leone). Inst. of Marine Biology and Oceanography.
For primary bibliographic entry see Field 5B.
W75-10472

PERSISTENCE OF CADMIUM-INDUCED METABOLIC CHANGES IN LIVER AND KIDNEY,
Ottawa Univ. (Ontario). Dept. of Pharmacology.
For primary bibliographic entry see Field 5A.
W75-10478

CHARACTERIZATION OF CADMIUM UPTAKE BY PLANT TISSUE,
California Univ., Davis. Dept. of Agronomy and Range Science.
For primary bibliographic entry see Field 5B.
W75-10479

SUPPRESSION OF NITROGEN FIXATION BY BLUE-GREEN ALAGE IN A EUTROPHIC LAKE WITH TRACE ADDITIONS OF COPPER,
California Univ., Berkeley. Sanitary Engineering Research Lab.
A. J. Horne, and C. R. Goldman.
Science, Vol 183, No 4123, p 409-411, February, 1974. 1 fig, 1 tab, 19 ref.

Descriptors: *Pollution abatement, *Lakes, *Copper, *Chelation, *Eutrophication, Chemical reactions, Nitrogen, Plankton, Surface waters, *Cyanophyta, Water pollution effects, Water pollution control.

The specific effects of very low concentrations of added and indigenous copper on phytoplanktonic N2 fixation and photosynthesis in a lake where natural chelation should be high were reported. Nitrogen fixation by blue-green algae in highly eutrophic Clear Lake, California, was severely inhibited by trace amounts of copper. The chelation capacity of the lake was probably saturated by indigenous copper. Additions were only 1/200 of those normally used in algal control. Since nitrogen fixation provides half of the lake's annual nitrogen budget, economical eutrophication control appears possible. (Jernigan-Vanderbilt)
W75-10480

ABSORPTION OF CADMIUM, COPPER AND ZINC BY DOG WHELKS IN THE BRISTOL CHANNEL,
Bristol Univ. (England). School of Chemistry.
For primary bibliographic entry see Field 5B.
W75-10481

LEAD METABOLISM IN THE NORMAL HUMAN: STABLE ISOTOPE STUDIES,
California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 5A.
W75-10484

WATER-SOIL-PLANT INTERACTIONS WITH TERBACIL,
Hawaii Univ.-Hilo Coll., Hilo.
B. A. Kratky, and G. F. Warren.
Weed Science, Vol 21, No 5, p 451-454, 1973. Illus.

Descriptors: *Toxicity, Water pollution effects, *Sorghum, *Soil-water-plant relationships, Soils, Loam.
Identifiers: Phytotoxicity, Sorghum-bicolor, *Terbacil.

The phytotoxicity of terbacil (3-tert-butyl-5-chloro-6-methyluracil) is not closely correlated with the amount applied, the amount in available soil solution, or the concentration in available soil solution since soil type has a pronounced effect on the levels necessary for phototoxicity. About 19 times more terbacil was needed in a Chalmers silty clay loam (24% organic matter) than in a Bloomfield fine sand (o.3% organic matter) to cause a 30% control of sorghum (Sorghum bicolor (L.) Moench 'R.S. 610'). However, the Bloomfield fine sand required twice as great a concentration of terbacil in the soil solution as the chalmers silty clay loam (0.314 micro-g/ml versus 0.157 micro-g/ml). The total adsorption of terbacil in the latter soil decreased 4.5 fold when the water: soil ratio was increased from 0.6:1 (approximately field capacity) to 32:1, but the ratio of the concentration adsorbed: concentration in the soil solution did not vary appreciably.--Copyright 1974, Biological Abstracts, Inc.
W75-10486

ARSENATE UPTAKE AND REDUCTION BY POCILLOPORA VERRUCOSA,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
M. E. Q. Pilson.
Limnology and Oceanography, Vol 19, No 2, p 339-341, March 1974. 1 fig, 8 ref. NSF (GA-34097).

Descriptors: *Coral, *Arsenic compounds, *Sea water, *Reduction(Chemical), Inorganic compounds, Chemical reactions, Phosphate, Cycles, *Absorption.

A scleractinian coral removed arsenate from solution and converted some of it to arsenite, which reappeared in the ambient seawater. This suggests that organisms other than bacteria may be responsible for maintaining some of the arsenic in seawater in a reduced form. Reduction of arsenate may be a mechanism to allow the loss from the living cell of arsenate transported in along with phosphate. (Jernigan-Vanderbilt)
W75-10491

EFFECT OF DIETARY SELENIUM ON GLUTATHIONE PEROXIDASE IN THE CHICK,
California Univ., Davis. Dept. of Food Science and Technology.
For primary bibliographic entry see Field 5A.
W75-10495

PRODUCTION OF MICROBIAL PROTEIN FROM WASTE CELLULOSE BY THERMOMONOSPORA FUSCA, A THERMOPHILIC ACTINOMYCETE,
Wisconsin Univ., Madison. Dept. of Bacteriology.
D. L. Crawford, E. McCoy, J. M. Harkin, and P. Jones.
Biotechnology and Bioengineering, Vol 15, No 5, p 833-843, 1973, Illus.

Descriptors: *Thermophilic bacteria, *Actinomycetes, Microbiology, Production, *Protein, *Cellulose, Pulp wastes.
Identifiers: Thermomonospora-fusca.

The growth characteristics of T. fusca, a cellulolytic thermophilic actinomycete, are described in terms of growth on pulping fines, a cellulosic waste of the paper industry. A fermentation was

developed which substantially degrades this waste, with the residual product of growth containing about 30% microbial protein. This protein, as shown by a preliminary feeding study with baby chicks and by amino acid analyses, appears to be of good nutritional quality and contains no strongly toxic materials. The extracellular cellulolytic enzymes present in the spent broth are discussed in relation to their potential recovery as a by-product of the fermentation as a waste disposal system.--Copyright 1974, Biological Abstracts, Inc.
W75-10538

ENRICHMENT OF SURFACE FRESHWATER MICROLAYERS WITH ALGAE,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
For primary bibliographic entry see Field 5A.
W75-10583

WATER QUALITY CRITERIA FOR EUROPEAN FRESH-WATER FISH.
Food and Agriculture Organization of the United Nations, Rome (Italy). European Inland Fisheries Advisory Commission.
Water Research, Vol 8, No 9, p 681, September 1974. 1 tab. EIFAC Technical Paper No. 20.

Descriptors: *Salmonids, *Chlorine, *Fish, *Invertebrates, Aquatic life, *Toxicity, *Water quality standards, Water pollution effects.
Identifiers: *Hypochlorous acid, *Chloramines, Bioaccumulation.

Toxicity of chlorine as hypochlorous acid and chloramines to aquatic life was studied. Coarse fish species, invertebrate organisms and plants were more resistant to chlorine than salmonids. Chlorine concentrations greater than 0.008 mg HOCl l(-1) were harmful or lethal within four days to both salmonids and coarse fish, whereas 0.004 mg HOCl l(-1) was endured by sensitive species of fish for five days. The effects of dissolved oxygen concentration, temperature, salinity, pH and water hardness on toxicity of chlorine were discussed. (Katz)
W75-10609

WATER QUALITY CRITERIA FOR EUROPEAN FRESHWATER FISH.
Food and Agriculture Organization of the United Nations, Rome (Italy). European Inland Fisheries Advisory Commission.
Water Research, Vol 8, No 9, p 683-684, September 1974. 1 tab. EIFAC Technical Paper No. 21.

Descriptors: *Freshwater fish, Salmonids, Atlantic salmon, Rainbow trout, Brown trout, Carp, *Fish behavior, *Zinc, *Metals, *Toxicity, *Water qualitystandards, Water pollution effects, Fish behavior, Environmental effects.
Identifiers: Gold fish, Bioaccumulation, Avoidance behavior.

The toxicity of solutions containing zinc was attributable to the zinc ion and possibly to particulate zinc present as the basic carbonate or the hydroxide held in suspension. It was modified by water quality, particularly by an increase in hardness, temperature, salinity, suspended solids and dissolved oxygen. The acute toxicity of zinc in the presence of other heavy metals and common pollutants seemed to be additive. The effect of zinc was reduced by acclimation and age of fish. Atlantic salmon, rainbow trout, carp, goldfish, brown trout in both field and laboratory studies demonstrated avoidance behavior patterns to certain zinc concentrations. For the maintenance of thriving populations of fish the annual 95 percentile of concentrations of zinc should be no greater than 0.1 of the appropriate 7-d LC50 at 15C. The criteria would depend on the water hardness and type of fish. (Katz)
W75-10610

STUDIES ON THE METABOLISM OF CHLOROPHENOLS IN FISH-III ISOLATION AND IDENTIFICATION OF A CONJUGATED PCP EXCRETED BY GOLDFISH,
Hyogo Prefecture Fisheries Experiment Station, Kobe (Japan).
For primary bibliographic entry see Field 5A.
W75-10611

INHIBITION OF ATPASES ACITIVITY IN CHANNEL CATFISH BRAIN BY KEPONE(TRADE NAME) AND ITS REDUCTION PRODUCT,
Mississippi State Univ., Mississippi State. Dept. of Biochemistry.
D. Desaiah, and R. B. Koch.
Bulletin of Environmental Contamination and Toxicology, Vol 13, No 2, p 153-158, February 1975. 1 fig, 3 tab, 19 ref.

Descriptors: Freshwater fish, *Catfish, *Fish, Physiology, Biochemistry, *Enzymes, Organic compounds, *Bioassay, Laboratory tests, Design, Methodology, Inhibition, Water pollution effects.
Identifiers: *Channel catfish, Ictalurus punctatus, *ATPases, *Kepone(Trade Name), DCPD, Tissue analysis, Brain.

The effects of Kepone(Trade Name) and its reduction product DCPD (decachloropentacyclo-decan-5-ol) on channel catfish, Ictalurus punctatus, brain ATPases in vitro were studied. The inhibition of Na+-K+ ATPase by Kepone(Trade Name) and DCPD was similar. Inhibition increased with increased concentration of the inhibitors. Oligomycin-sensitive (mitochondrial) Mg+2 ATPase from catfish brain showed greatest sensitivity to the inhibitors. Oligomycin-insensitive Mg+2 ATPase activity showed similar sensitivity to the inhibitors but inhibition was less than for mitochondrial Mg+2 ATPase. (Katz)
W75-10612

COPPER, ZINC AND TOTAL PROTEIN LEVELS IN THE PLASMA OF SOCKEYE SALMON (ONCORHYNCHUS NERKA) DURING THEIR SPAWNING MIGRATION,
Memorial Univ. of Newfoundland, St. Johns. Marine Sciences Research Lab.
G. L. Fletcher, E. G. Watts, and M. J. King.
Journal of the Fisheries Research Board of Canada, Vol 32, No 1, p 78-82, January 1975. 2 fig, 1 tab, 19 ref.

Descriptors: Salmonids, *Sockeye salmon, Heavy metals, *Proteins, Fish physiology, Bioassay, Growth stages, *Metabolism, *Spawning, Fish reproduction, *Fish Migration, Laboratory tests, Water pollution effects, Canada, *Zinc, *Copper.
Identifiers: Tissue analysis, Bioaccumulation, Plasma, Plasma proteins.

Concentrations of copper, zinc and total protein were measured in the plasma of sockeye salmon (Oncorhynchus nerka) during their migration to the Chilko spawning grounds, British Columbia. Concentrations of both metals and total protein declined during migration. Final values for all three parameters were 20-50% of those observed in seawater animals. Concentrations of zinc and copper were positively correlated with plasma protein concentrations. An examination of the metal: protein ratios revealed that only the zinc: protein ratios declined during migration, suggesting that zinc was being removed from the plasma independent of the proteins. (Katz)
W75-10613

RESIDUE ANALYSES ON 2-AMINO-4 PHENYLTHIAZOLE, A PISCINE ANESTHETIC, IN FISHES-I A MODEL RADIO-TRACER EXPERIMENT WITH MEDAKA,
Meiji Seiki Kaisha Ltd., Yokohama (Japan). Research Labs.
For primary bibliographic entry see Field 5A.
W75-10614

ASPECTS OF THE WINTER ECOLOGY OF JUVENILE COHO SALMON (ONCORHYNCHUS KISUTCH) AND STEELHEAD TROUT (SALMO GAIRDNERI),
British Columbia Univ., Vancouver. Dept. of Forestry.
D. R. Bustard, and D. W. Narver.
Journal of the Fisheries Research Board of Canada, Vol 32, No 5, p 667-680, May 1975. 9 fig, 1 tab, 15 ref.

Descriptors: *Salmonids, *Salmon, *Trout, Fish behavior, *Biorhythms, Streams, *Growth stages, *Juvenile growth stage, Seasonal, Winter food habits, Life cycles, Environmental effects, Forests, Habitats, Water temperature.

The major physical characteristics of overwintering areas for juvenile coho salmon (Oncorhynchus kisutch) and steelhead trout (Salmo gairdneri) were described for a small, unlogged stream. Mean depths of water, maximum water velocities, water temperatures, winter cover selection, feeding and hiding behavior, tributary. movements and environmental change effects were discussed for the coho salmon and steelhead trout. (Katz)
W75-10615

ON THE ACCUMULATION OF ORGANOCHLORINE PESTICIDES, PCB AND CERTAIN HEAVY METALS IN FISH AND SHELLFISH FROM THAI COASTAL AND INLAND WATERS,
Bundesforschungsanstalt fuer Fischerei, Hamburg (West Germany). Isotopenlaboratorium.
For primary bibliographic entry see Field 5B.
W75-10616

ADDITIONAL STUDIES OF THE FISHES, MACROINVERTEBRATES AND HYDROLOGICAL CONDITIONS OF UPLAND CANALS IN TAMPA BAY, FLORIDA,
National Marine Fisheries Service, St. Petersburg, Fla. Southeast Region.
W. N. Lindall, Jr., W. A. Fable, Jr., and L. A. Collins.
Fishery Bulletin, Vol 73, No 1, p 81-85, January 1975. 5 fig, 1 tab, 7 ref.

Descriptors: *Canals, *Environmental effects, Salinity, *Dissolved oxygen, Sampling, Land management, Ecological distribution, *Florida, Water pollution effects, Data collections, Hydrologic data.
Identifiers: *Upland canals, *Tampa Bay(Fla), Comparative studies, Species.

Hydrological and biological data from a concluding study of upland canals in Tampa Bay, Florida, were presented and compared with those collected in the previous year. Critically low levels of dissolved oxygen occurred more frequently and over a longer period of time in the second year. Most affected were the inland portions of the canal system where the number of species declined markedly over the previous year. Impoverishment of fauna on or near the bottom was expected to recur during summer months because of oxygen depletion resulting from continuing accumulation of decomposing organic sediments, warm water, and little circulation in the dead-end canals. (Katz)
W75-10617

DEVICES FOR TOXICOLOGICAL LONG-TERM STUDIES ON AQUATIC ORGANISMS (GERATE ZUR DURCHFUHRUNG TOXIKOLOGISCHER LANGZEITSTUDIEN AN WASSERORGANISMEN),
Farbwerke Hoechst, Frankfurt am Main (West Germany).
For primary bibliographic entry see Field 5A.
W75-10618

ACUTE TOXICITY OF AMMONIA TO SEVERAL DEVELOPMENTAL, STAGES OF RAINBOW TROUT, SALMO GAIRDNERI,
Kent State Univ., Ohio. Dept. of Biological Science.
S. D. Rice, and R. M. Stokes.
Fishery Bulletin, Vol 73, No 1, p 207-211, January 1975. 1 fig, 1 tab, 25 ref.

Descriptors: *Salmonids, *Rainbow trout, *Growth stages, Fish eggs, *Embryonic growth stage, Nitrogen compounds, *Ammonia, *Bioassays, *Toxicity, Fish physiology, Laboratory tests, Water pollution effects, Environmental effects, *Lethal limit.
Identifiers: Alevins, Tolerance limits, TLM, Survival rates, Bioaccumulation.

Median tolerance limits derived from 24-h bioassays demonstrated that fertilized eggs and alevins of rainbow trout, Salmo gairdneri, were not vulnerable to 3.58 ppm un-ionized ammonia at 10 degrees C (pH 8.3). At the end of yolk absorption, rainbow trout fry increased in susceptibility dramatically, their median tolerance limit values were about 0.072 ppm, the same as for adult trout. Fertilization of eggs was not prevented in un-ionized ammonia solutions up to 1.79 ppm, the highest exposure tested. Results indicated that rainbow trout embryos and alevins were safer from ammonia toxicity than were older salmonids. (Katz)
W75-10619

THE CONCENTRATION OF MERCURY, COPPER, NICKEL, SILVER, CADMIUM AND LEAD IN THE NORTHERN ADRIATIC ANCHOVY, ENGRAULIS ENCRASICHOLUS, AND SARDINE, SARDINA PILCHARDUS,
Australian Inst. of Marine Sciences, Townsville.
For primary bibliographic entry see Field 5B.
W75-10620

TOXAPHENE EFFECTS ON GROWTH AND DEVELOPMENT OF BROOK TROUT (SALVELINUS FONTINALIS),
Bureau of Sport Fisheries and Wildlife, Columbia, Mo. Fish-Pesticide Research Lab.
P. M. Mehrle, and F. L. Mayer, Jr.
Journal of the Fisheries Research Board of Canada, Vol 32, No 5, p 609-613, May 1975. 4 tab, 19 ref.

Descriptors: *Salmonids, *Trout, *Brook trout, *Growth stages, Fish eggs, Frys, *Fish physiology, *Growth rates, Bioassay, *Halogenateed pesticides, Water pollution effects, Environmental effects, Laboratory tests, Calcium, Phosphorus, Toxicity.
Identifiers: *Toxaphene, Tissue analysis, Bioaccumulation, Organochlorine insecticides, Collagen.

Twenty-two days before hatching, eyed eggs of brook trout (Salvelinus fontinalis) were placed in a flow-through system and continuously exposed to toxaphene (0, 39, 68, 139, 288 and 502 ng/liter) until they hatched and the resulting fry were exposed for a further 90 days. Hatchability was not affected by toxaphene, but all of the fry exposed to 502 and 288 ng/liter of toxaphene died by 30 and 60 days after hatch, respectively. Growth of fry was significantly depressed at the 139 and 288 ng/liter concentrations 30 days after hatch and at all concentrations after 60 and 90 days of toxaphene exposure. Whole body collagen of fry, as estimated by hydroxyproline, was significantly decreased in the four higher concentrations of toxaphene within 7-15 days after hatch. Backbone collagen was significantly decreased ($P < 0.05$) in 30-, 60-, and 90-day old fry exposed to toxaphene, whereas calcium and phosphorus concentrations in the backbone were increased ($P < 0.05$). The mineral:collagen ratio was significantly increased by toxaphene. (Katz)
W75-10621

PCBS IN THE SPOTTED SHARKS, MUSTELUS MANAZO, FROM TOKYO BAY, (IN JAPANESE),
Tokai Regional Fisheries Research Lab., Tokyo (Japan).
For primary bibliographic entry see Field 5A.
W75-10622

EFFECTS OF TEMPERATURE ON DEVELOPMENT AND SURVIVAL OF RAINBOW TROUT, SALMO GAIRDNERI, IN ACID WATERS,
Ontario Ministry of Natural Resources, Sault Ste. Marie (Ontario). Fish and Wildlife Research Branch.
W-H. Kwain.
Journal of the Fisheries Research Board of Canada, Vol 32, No 4, p 493-497, April 1975. 3 fig, 15 ref.

Descriptors: *Salmonids, *Rainbow trout, *Growth stages, *Embryonic growth stage, Fish eggs, *Mortality, *Toxicity, Hydrogen ion concentration, *Water temperature, Water quality, Water pollution effects, Laboratory tests, Lethal limit, Fish physiology, Acidic water.
Identifiers: Fingerlings, LC50, Survival rates, Bioaccumulation.

Differences in mortality of rainbow trout, Salmo gairdneri, embryos were significant ($P < 0.05$) when the eggs were exposed to 5,10, and 15C and pH levels from 3.0 to 6.0. Below pH values of 4.49 no embryos survived, regardless of temperature. The medium lethal pH values for rainbow embryos were 4.75 and 5.52 at temperatures of 10 and 5C, respectively. Differences in lethal pH values for fingerlings were significant ($P < 0.05$) when exposed to water temperatures of 5,10,15 and 20C and acclimation temperatures of 10 and 20C. The median lethal pH values of fingerlings were positively related to the test water temperatures and ranged from 3.86 to 4.49. Resistance of yearling trout to acid waters was higher than of fingerlings. (Katz)
W75-10623

THE EFFECT OF SUBLETHAL CONCENTRATIONS OF COPPER AND ZINC ON VENTILATORY ACTIVITY, BLOOD OXYGEN, AND PH IN RAINBOW TROUT (SALMO GAIRDNERI),
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
C. M. Sellers, Jr, A. C. Heath, and M. L. Bass.
Water Research, Vol 9, No 4, p 401-408, April 1975. 7 fig, 39 ref.

Descriptors: *Salmonids, *Rainbow trout, *Heavy metals, *Zinc, *Copper, *Fish physiology, *Respiration, *Bioassay, Ventilation, Hydrogen ion concentration, Oxygen requirements, Laboratory tests, Toxicity, Environmental effects, Water pollution effects, *Lethal limit.
Identifiers: Blood oxygen, Sublethal concentrations, Gills, Catherization, Coughing, Pressure pulses.

Changes in buccal and opercular pressure amplitude, as well as ventilation and coughing frequency were monitored in rainbow trout (Salmo gairdneri) using catheterization of respiratory cavities and pressure transducers. One or more of the ventilatory parameters measured were found to change under toxicant stress at concentrations of copper or zinc at or below the LC50. Possible synergistic effects were indicated when the two metal ions were tested together. Serial analyses of arterial P02 and pH in fish exposed to copper and zinc individually at concentrations approximating the LC50 showed that environmental zinc produced a sharp decrease in both P02 and pH. Copper, however, caused little effect other than a transient increase in pH. The toxic action of the two metals in low concentrations thus may not be the same. (Katz)
W75-10624

HERBICIDES IN AQUATIC SYSTEMS,
Nature Conservancy, Abbots Ripton (England). Monks Wood Experimental Station.
C. Newbold.
Biological Conservation, Vol 7, No 2, p 97-118, February 1975. 1 fig, 5 tab, 58 ref.

Descriptors: Environmental effects, *Primary productivity, *Ecosystems, *Secondary productivity, *Food chains, Water pollution sources, *Herbicides, Diquat, Paraquat, 2,4-D, *Dalapon, *Copper sulfate, *Spraying, *Fish, *Aquatic plants, Toxicity, Insect control, Aquatic habitats.
Identifiers: Dichlobenil, Chlorthiamid, Terbutryne, Diuron, *Asulam, Maleic hydrazide, Maleic hydrazide, 2,4-D chlorophan, *Aquatic herbicide properties, LC50, Britain.

The characteristics of twelve herbicides used in Britain - diquat, paraquat, dichlobenil, chlorthiamid, terbutryne, dalapon, diuron, asulam, copper sulphate, maleic hydrazide, maleic hydrazide,2,4-D,chlorpropham, and 2,4-D,amine were discussed. Properties including mode of action, persistence in muds, breakdown in water, form, treatment level, LC50 for fish and LC50 for Daphnia were presented for each herbicide. Short-term and long term effects resulting from herbicide spraying were discussed. (Katz)
W75-10625

ABSORPTION, METABOLISM, AND EXCRETION BY GOLDFISH OF THE ANIONIC DETERGENT SODIUM LAURYL SULPHATE,
Unilever Ltd., Sharnbrook (England). Unilever Research Lab.
P. W. A. Tovell, D. Howes, and C. S. Newsome.
Toxicology, Vol 4, No 1, p 17-29, 1975. 9 fig, 1 tab, 25 ref.

Descriptors: *Sulfates, *Sodium sulfate, *Freshwater fish, *Fish physiology, *Bioassay, *Metabolism, *Path of pollutants, *Detergents, *Absorption, Laboratory tests, Water pollution effects.
Identifiers: *Goldfish, Carassius auratus, Tissue analysis, Excretion, Bioaccumulation, Sodium lauryl sulphate, Anionic detergent, SLS, Gall bladder.

The route of absorption, tissue distribution, metabolism, route of excretion, and excretion rate of the anionic detergent sodium lauryl sulphate (SLS) in goldfish (Carassius auratus) was investigated using (35S) or (1-14C) SLS. Goldfish absorb SLS from solution principally through the gills. SLS is rapidly distributed throughout the body tissues, the highest concentration being found in the gall bladder. SLS was metabolized by the fish to butyric acid-4-sulphate, and was excreted by the kidney. Over a 24-h period 68% and 38% of a prescribed dose was excreted from freely fed and unfed fish, respectively. (Katz)
W75-10626

THE EFFECT OF SOME HEAVY METAL IONS ON PHOTOSYNTHESIS IN A FRESHWATER ALGA,
Institute of Marine Biochemistry, Aberdeen (Scotland).
J. Overnell.
Festicide, Biochemistry and Physiology, Vol 5, No 1, p 19-26, 1975. 3 fig, 1 tab, 22 ref.

Descriptors: *Heavy metals, Copper, Cadmium, Lead, Mercury, *Herbicides, *Photosynthesis, *Plant physiology, *Algae, *Ions, Path of pollutants, Laboratory tests, Bioassay, Water pollution effects, Environmental effects, Toxicity.
Identifiers: Methyl mercury, Thallium, 3(3-4-dichlorophenyl)1-1-dimethylurea, *Chlamydomonas reinhardii, Bioaccumulation, Light-induced oxygen evolution, *Hill reaction, Mehler reaction.

The effect of copper, cadmium, lead, mercury, methyl mercury, thallium and the herbicide 2(3-4-dichlorophenyl) 1, 1-dimethylurea on the light-induced oxygen evolution, the hill reaction and a modified Mehler reaction was studied with the freshwater alga Chlamydomonas reinhardii. The light-induced oxygen evolution of whole cells was very sensitive to the cadmium ion, but this ion was almost without effect on the Hill reaction and the modified Mehler reaction. The light-induced oxygen evolution was also very sensitive to methyl mercury and lead. (Katz)
W75-10627

INFLUENCE OF A THERMAL EFFLUENT ON MOVEMENT OF BROWN BULLHEAD (ICTALURUS NEBULOSUS) AS DETERMINED BY ULTRASONIC TRACKING,
Canada Centre for Inland Waters, Burlington (Ontario).
J. R. M. Kelso.
Journal of the Fisheries Research Board of Canada, Vol 31, No 9, p 1507-1512, September 1974. 5 fig, 2 tab, 7 ref.

Descriptors: *Bullheads, *Ultrasonics, *Marking techniques, *Thermal pollution, Effluents, *Fish physiology, Temperature, Nuclear powerplants, Water pollution effects, *Pollutant identification.
Identifiers: *Brown bullhead, Swimming characteristics, Movement patterns, Lake Ontario, Thermal plume.

Ten Brown bullhead (Ictalurus nebulosus) were captured within the influence of a thermal discharge in Lake Ontario, marked with ultrasonic transmitters and continuously tracked for 29-344 minutes. Five control bullheads were similarly monitored at a control site. Fish caught and released in the discharge area remained within 50-700m of the release point, turned frequently and sharply, and swam at an average speed of 30 cm/s. Control fish moved along shore, average speed 48 cm/s, in straighter paths up to 4200 m from the release point. On the morning following release, only 20% of the fish released in the discharge were still there, indicating that association with the plume was of short duration. The study indicates that the thermal discharge can interrupt or alter normal movement patterns of brown bullhead. (Katz)
W75-10628

UPTAKE, ELIMINATION AND BIOTRANSFORMATION OF THE LAMPRICIDE 3-TRIFLUROMETHYL-4-NITROPHENOL (TFM) BY LARVAE OF THE AQUATIC MIDGE CHIRONOMUS TENTANS,
Viterbo Coll., La Crosse, Wis. Dept. of Biology.
J. A. Kawatski, and M. A. Bittner.
Toxicology, Vol 4, No 2, p 183-194, May 1975. 3 fig, 5 tab, 9 ref.

Descriptors: *Aquatic insects, *Midges, *Toxicity, *Organic compounds, Hardness(Water), *Bioassay, Water quality, Laboratory tests, Water pollution effects.
Identifiers: Chironomus tentans, *Lampricides, *TFM, 3-Trifluoromethyl-4-nitrophenol, *Sublethal concentrations, Tissue analysis, Bioaccumulation, Biotransformation.

Accumulation of (14C) 3-trifluoromethyl-4-nitrophenol ((14C) TFM) by aquatic midge, Chironomus tentans, larvae from sublethal aqueous concentrations was rapid and dependent upon hardness of water. TFM was readily biotranformed to at least two polar derivatives, including sulfated TFM and TFM-glucuronide. Some TFM was also reduced to the phenol/amine. Chironomus tentans quickly eliminated all TFM derivatives as well as the parent (14C) TFM. (Katz)
W75-10629

PHYSIOLOGICAL CHANGES IN THE SERUM AND HEPATOPANCREAS OF YELLOW TAIL INJECTED WITH CARBON TETRACHLORIDE, (IN JAPANESE),
Hyogo Prefecture Fisheries Experiment Station, Akashi (Japan).
H. Sakaguchi, and A. Hamaguchi.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 41, No 3, p 283-290, March 1975; 2 fig, 6 tab, 14 ref.

Descriptors: Fish, Organic compounds, *Fish physiology, *Enzymes, *Bioassay, Laboratory tests, Water pollution effects.
Identifiers: *Carbon tetrachloride, *Yellow tail, Tissue analysis, Bioaccumulation, *Serum, *Hepatopancreas.

Yellow tail were injected with carbon tetrachloride at dosages of 0.05-0.2 ml/100 g body weight. Separation of cell cords, congestion of sinusoid and a decrease in the number and size of lipids in the hepatopancreas were observed. Activities of lactic dehydrogenase (LDH), glutamic oxaloacetic transaminase (GOT) and glutamic pyruvic transaminase (GPT) in serum increased. Serum triglyceride, total cholesterol, beta-lipoprotein and protein decreased after 2 to 6 hours, but recovered to control levels after 24 hours. (Katz)
W75-10630

EFFECTS OF CHLORINATED HYDROCARBON POLLUTANTS ON GROWTH OF MARINE PHYTOPLANKTON IN CULTURE,
State Univ. of New York, Stony Brook.
N. S. Fisher.
Available from University Microfilms, Inc., Ann Arbor, Michigan, 48106. Order No 74-27,824. PhD Thesis, 1974, 195 p.

Descriptors: *Toxicity, *Water pollutant effects, *Algae, *Chlorinated hydrocarbon pesticides, *DDT, Polychlorinated biphenyls, Cultures, *Phytoplankton, Organic compounds, Plant growth, Marine algae.

An evaluation was made of the applicability of batch and continuous culture toxicity tests to natural ecosystems. Six species of marine planktonic algae were subjected to polychlorinated biphenyls and DDT in various concentrations. The effect of these compounds on their growth was studied. Both artificial communities and natural communities of the algae were observed. Due to an impermanence of conditions in aquatic environments and the relatively low phytoplankton cell densities normally occurring, most phytoplankton species will adopt a density-dependent strategy, involving such mechanisms as allelochemics. By interfering with competitive abilities of some phytoplankton, chlorinated hydrocarbons disrupt successional patterns and alter species composition in algal communities in nature. Animal communities would be indirectly affected as many herbivores graze selectively. (Prague-FIRL)
W75-10636

THE EFFECT OF CERTAIN ORGANIC POLLUTANTS ON COPPER TOXICITY TO FISH (LEBISTES RETICULATUS),
Michigan Univ., Ann Arbor.
J. A. Black.
Available from University Microfilms, Inc., Ann Arbor, Michigan, 48106. Order No 74-25,152. PhD Thesis, 1974, 140 p.

Descriptors: *Water pollutant effects, *Organic wastes, *Toxicity, *Copper, Fish toxins, Bioassay, Sewage, Metals, Pollutant identification.
Identifiers: *Anodic stripping voltammetry, Organic pollutants.

Anodic stripping voltammetry (ASV) was used to measure the degree of copper-organic binding in bioassay solutions. The relative toxicities of several copper-organic complexes to fish and the relationship of these toxicities of the relative binding abilities of the organic ligands for copper were studied. Guppies were exposed to copper-organic complexes during 96 hour bioassays conducted in soft water at pH 7.5. Fish were analyzed by atomic absorption spectrophotometry to determine the amount of copper accumulation in internal organs. The organic compounds tested were chosen on the basis of their prevalence as pollutants. Glycine, cysteine, EDTA, NTA, and citric acid were tested in the concentration range of 1 to 3 times ten to the minus sixth power M. Albumin, humic acid, and secondary sewage effluents had concentrations of 5.0 mg/liter. The organic compounds found to reduce copper toxicity to fish included NTA, glycine, EDTA, and humic acid. Those with no effect on toxicity were albumin, sewage effluent, cysteine, and citric acid. Organically bound copper is less toxic than unbound copper. The methodology of ASV is discussed as a possible technique to predict metal toxicity in natural waters. (Prague-FIRL)
W75-10637

800 MILES TO GO,
Alyeska Pipeline Service Co., Bellevue, Wash.
R. H. Merrett.
NLGI Spokesman, Vol 38, No 12, p 421-427, March, 1975. 14 fig.

Descriptors: *Pipelines, *Alaska, *Environmental effects, Water quality control, Oil wastes, Monitoring, Costs, Personnel, Oil pollution.
Identifiers: *Alaska pipeline.

The Alaska pipeline and its environmental effects are discussed. Both Federal and State agencies have been assigned to monitor pipeline work. A two lane 360-mile road is being built along the route of the pipeline as well as shorter auxilliary roads. The project is the largest privately funded construction effort ever undertaken, amounting to $4.5 billion. The extreme terrain and temperatures along its 800 miles present unique problems in engineering and design. Water and air quality control facilities are described. All ballast water from tankers which take on oil will be processed and purified before being returned to the harbor. Water will be discharged with less than 8 ppm of oil. Problems of long-term management such as cost monitoring, personnel management, and the scheduling of inspections are detailed. (Prague-FIRL)
W75-10638

ICEBREAKING DRILLSHIP FOR OFFSHORE EXPLORATORY DRILLING IN THE ARCTIC,
For primary bibliographic entry see Field 5G.
W75-10639

OIL IN THE SEA.
For primary bibliographic entry see Field 5B.
W75-10640

THE EFFECT OF CRUDE OIL FRACTIONS ON THE SURVIVAL OF A TIDEPOOL COPEPOD, TIGRIOPUS CALIFORNICUS,
California State Univ., Northridge. Dept. of Biology.
C. J. Barnett, and J. E. Kontogiannis.
Environmental Pollution, Vol 8, No 1, p 45-54, January, 1975. 6 fig, 7 ref.

Descriptors: *Oil pollution, Oceans, *Copepods, Crustaceans, Invertebrates, Laboratory studies, *Water pollution effects, Marine animals, Gasoline, *Toxicity, *Oil wastes, Industrial wastes, Organic compounds.
Identifiers: *Tigriopus californicus, Diesel oil, Kerosene, Benzene.

Oil pollution of oceans is a current ecological problem. The effects of petroleum products on various marine species are not well documented

but are now under both field and laboratory investigation. In this case, the effects of four common crude oil fractions on the surface of a tidepool copepod were studied in the laboratory. For Tigriopus californicus, four concentrations each of diesel oil, kerosene, gasoline, and benzene were tested. Diesel oil was the most detrimental; in concentrations of 0.10 ml/liter, mortality resulted within five days. Gasoline showed the highest mortality within the first 24 hours while benzene was most lethal between the first and second days. The order of toxicity from greatest to least was diesel oil, kerosene, gasoline, benzene. The more slowly evaporating crude oil fractions present the greatest hazards. The survival of this species is inversely proportional to the concentration of the crude oil fraction in the environment. (Prague-FIRL)
W75-10641

EFFECTS OF AN OFFSHORE CRUDE OIL UNLOADING TERMINAL ON THE MARINE ENVIRONMENT,
Texas A and M Univ., College Station. Environmental Engineering Div.
W. P. James, R. W. Hann, Jr., and F. Slowey.
Marine Technology Society Journal, Vol 9, No 1, p 28-31, January, 1975. 2 fig, 4 ref.

Descriptors: *Oil spills, Oil pollution, *Environmental effects, Sea water, Offshore platforms, Engineering structures, Pipelines, Construction, Water pollution effects, Texas.

Environmental aspects of a deepwater crude oil unloading terminal have been studied at two stations off the coast of Texas. The first study was conducted for the Council on Environmental Quality and the second for SEADOCK, Incorporated, both by Texas A and M University. SEADOCK is a corporation formed to operate a deepwater facility to handle very large crude carriers in the 100,000 to 700,000 deadweight ton class. The construction schedule and its impacts are outlines. Field sampling has been conducted to provide baseline information on the physical, chemical, and biological characteristics of the area, and to estimate the impact of the project on the marine environment. Fuel pipelines, trunklines, pumps, and mooring systems are described. The existence of platform structures, monobuoys and such pipelines should have little adverse impact on the marine environment and may provide an artificial reef for colonization by sessile marine organisms. Oil spill hazards were weighed by models developed which provided information on response time available for control, sections of the coast requiring protection, and concentrations of soluble oil fractions in the water column. The location of an offshore terminal complex was concluded to be the most sound choice environmentally, as any major spills would be less hazardous in an esturial inshore area. Transit time to inshore entrances should provide enough time for corrective action in the event of any oil spill. (Prague-FIRL)
W75-10642

TOXICITY OF CHLORINATED MUNICIPAL WASTES TO FISH: AN EVALUATION BASED ON MICHIGAN FIELD DATA,
Michigan Dept. of Natural Resources, Lansing. Bureau of Water Management.
R. Basch.
In: Proceedings of the 27th Industrial Waste Conference, May 2-4, 1972, Purdue University, Lafayette, Indiana, Engineering Extension Series No 141, Part 2, p 639-648. 5 tab, 16 ref.

Descriptors: *Chlorination, *Sewage treatment, *Toxicity, *Fishkill, Chemical reactions, Chlorine, *Michigan, Minnows, Rainbow trout, Lethal limit, *Municipal wastes, Water pollution effects, Data collection.

Chlorinated municipal waste discharges were lethal to rainbow trout held downstream from three of four Michigan plants studied. The major factor affecting chlorinated waste toxicity was toxicity was dilution by river flow. At the Charlotte treatment plant the mean total residual chlorine concentration (TRC) of the effluent during exposure was 1.77 mg/l. Almost 100% kill of trout was observed 3200 ft downstream during exposure. The toxicity ceased between 3200-10,500 ft downstream, with extremely low TRC found toxic (an average of 0.007 mg/l). The West Branch treatment plant TRC exposure was 1.35 mg/l. This waste was toxic to 50% of the fish 500 ft downstream. The trout survived a mean TRC of 0.002 mg/l at another station. The Mason treatment plant TRC concentration was 2.64 mg/l. Toxicity was evident at least 4600 ft downstream. Extremely low concentration (0.046 mg/l) were toxic to the trout but they survived 0.013 mg/l at another station. The mean TRC during the chlorinated exposure at the Roscommon plant was 18.92 mg/l. No fish mortality was evident, apparently due to the high dilution of the waste in the river. It is recommended that in-plant monitoring of chlorine be performed with a more accurate means than the orthotolidine color comparator. (Auen-Wisconsin)
W75-10680

WILL WASTEWATER TREATMENT STOP EUTROPHICATION OF IMPOUNDMENTS,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
For primary bibliographic entry see Field 5D.
W75-10686

ANALYSIS OF POLLUTION FROM MARINE ENGINES - STATUS REPORT,
Environmental Control Technology Corp., Ann Arbor, Mich.
For primary bibliographic entry see Field 5A.
W75-10688

POPULATION DYNAMICS OF PROTOZOA IN WASTEWATER, AND IMPACT OF ENVIRONMENTAL CHANGES,
Howard Univ., Washington, D.C. Bio-Environmental Engineering and Sciences Research Lab.
For primary bibliographic entry see Field 5D.
W75-10689

FISHES OF THE HIWASSEE RIVER SYSTEM: ECOLOGICAL AND TAXONOMIC CONSIDERATIONS,
Wapora, Inc., Washington, D.C.
R. K. Hitch, and D. A. Etnier.
J Tenn Acad Sci, Vol 49, No 3, p 81-87, 1974, Illus.

Descriptors: *Tennessee, *Fish, *Systematics, Ecology, Rivers, *Ecological distribution, Mine wastes, Tributaries, Water pollution effects.
Identifiers: Etheostoma camurum, *Hiwassee River(Tenn), Hypentelium-etowanum, Ichthyozon-hubbsi, Micropterus-coosae, Notropis-spectrunculus, Perca-flavescens, Percina-aurantiaca, Percina-burtoni, Percina-squa-ata, Phoxinus, *Fish diversity.

Collections of fishes (72) were made in the Hiwassee River Tennessee, and its tributaries between Aug. 1970-July, 1971. Greatest emphasis was placed on studies of the ecological relationships, distribution, and taxonomy of smaller species. Seventy-two species of fishes are known to occur in the Hiwassee system, with species of special significance including Ichthyomyzon hubbsi, Notropis spectrunculus, and undescribed dace of the genus Phoxinus, Hypentelium etowanum, Micropterus coosae, Perca flavescens, Etheostoma camurum, Percina aurantiaca, P. burtoni and P. squamata. Mining wastes were found to have greatly reduced the diversity of fishes in the Ocoee River and some of its tributaries.--Copyright 1974, Biological Abstracts, Inc.
W75-10694

TOXICITY OF THE LAMPRICIDE 3-TRIFLUOROMETHYL-4-NITROPHENOL (TFM) TO 10 SPECIES OF ALGAE,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
A. W. Maki, L. D. Geissel, and H. E. Johnson.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. In: Investigations in Fish Control, United States Department of the Interior, Fish and Wildlife Service, Washington, D.C. 1975, No 56. 17 p, 3 fig, 5 tab, 12 ref.

Descriptors: *Pesticides, *Algae, *Growth rates, *Toxicity, Laboratory tests, Environmental effects, Chlorophyta, Toxicants, Diatoms, Cyanophyta, Inhibition, Inhibitors, Analytical techniques, Primary productivity, Mortality.
Identifiers: *Lampricides, *TFM, *Sublethal effects, Anabaena ssp., Chlorella ssp.

The toxicity of analytical and field grades of the lampricide-3-trifluoro-methyl-4-nitrophenol (TFM), to unialgal cultures of four green algae, four blue-green algae and two species of diatoms was examined in 96-hour toxicity tests. A 50% inhibitation of growth occurred in concentrations less than 10 mg/liter of TFM for all species tested except Chlorella pyrenoidosa, which was resistance at concentrations greater than 15 mg/liter. Inhibition of growth was lowest in the blue-green species, generally intermediate in the green algae, and severe in diatoms (50% effect levels, 1-4 mg/liter). Field grade TFM tended to be more toxic than the analytical grades. Growth tests indicated that exposure to TFM at concentrations of 30 mg/liter for 96 hours did not destroy the viability of algae cells but temporarily inhibited growth. (Katz)
W75-10697

ACUTE TOXICITIES OF 3-TRIFLUOROMETHYL-4-NITROPHENOL (TFM) AND 2',5-DICHLORO-4'-NITROSALICYLANILIDE (BAYER 73) TO LARVAE OF THE MIDGE (CHIRONOMUS TENTANS),
Viterbo Coll., LaCrosse, Wis. Dept. of Biology.
J. A. Kawatski, M. M. Ledvina, and C. R. Hansen, Jr.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402. In: Investigations in Fish Control, United States Department of the Interior, Fish and Wildlife Service, Washington, D.C., 1975, No 57, 5 p, 2 tab, 11 ref.

Descriptors: *Toxicity, *Pesticides, *Midges, *Hardness(Water), Laboratory tests, Food chains, Environmental effects, Water quality, Invertebrates, Aquatic insects, Toxicants, Mortality.
Identifiers: *TFM, Bayer 73, *Synergistic effects, EC50(Immobility), *Chironomus tentans, Molluscides, Lampricides, Sublethal effects.

TFM (3-trifluoromethyl-4-nitrophenol) and Bayer 73 (2',5-dichloro-4'-nitrosalicylanilide) were tested individually and together for toxicity to fourth instar Chironomus tentans in laboratory static tests at 22C. The 24-hr EC50 (immobility) values in soft water (total hardness, 40-48 mg/l as CaCo3) were 1.55 mg/l of 95.7% TFM, 0.570 mg/l of 70% Bayer 73, and 0.658 mg/l of total toxicant for a 98:2 mixture of TFM and Bayer 73. As water hardness increased, toxicity of the materials individually and in mixtures decreased. Synergistic toxicity was apparent only in soft water at exposures of 24-72 hr; generally, the toxic effect was additive. Considerably greater concentrations of toxicant were required to kill than to immobilize. (Katz)
W75-10698

ACUTE TOXICITY OF THE LAMPRICIDE 3-TRIFLUOROMETHYL-4-NITRO-PHENOL (TFM) TO NYMPHS OF MAYFLIES (HEXAGENIA SP.),
Winona State Coll., Minn.
C. R. Fremling.

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402. In: Investigations in Fish Control, United States Department of the Interior, Fish and Wildlife Service, Washington D.C. 1975, No 58. 6 p, 1 fig, 16 ref.

Descriptors: *Toxicity, *Mayflies, *Pesticides, *Artifical substrates, *Hardness(Water), *Food chains, Temperature, Invertebrates, Environmental effects, Laboratory tests, Aquatic insects, Insects, Bioassay, Lethal limit, Hydrogen ion, Concentration, Toxicants.
Identifiers: *Lampricides, *TFM, *Hexagenia sp., LC50, Nymphs.

A recylcing test apparatus and burrow-containing artificial substrates were used to determine the toxicity of the lampricide TFM (3-trifluoromethyl-4-nitrophenol) against Hexagenia mayfly nymphs. Toxicity was relatively independent of temperature, but was greater in soft water than in hard water, and much greater at low than at high pH's; 12-hr LC50's were 4.0 at pH 6.5 and 270.0 at pH 9.5. (Katz)
W75-10699

TOXICITY AND RESIDUE DYNAMICS OF THE LAMPRICIDE 3-TRIFLUORO-METHYL-4-NITROPHENOL (TFM) IN AQUATIC INVERTEBRATES,
Bureau of Sport Fisheries and Wildlife, Columbia, Mo. Fish-Pesticide Research Lab.
H. O. Sanders, and D. F. Walsh.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402. In: Investigations in Fish Control, United States Department of the Interior, Fish and Wildlife Service, Washington, D.C. 1975, No 59. 7 p, 3 tab, 13 ref.

Descriptors: *Invertebrates, *Toxicity, *Pesticides, *Reproduction, *Mayflies, *Daphnia, *Crayfish, Pesticide residues, Environmental effects, Absorption, Aquatic insects, Lethal limit, Toxicants, Hardness(Water).
Identifiers: *TFM, *Lampricides, *Sublethal effects, Bioaccumulation, Scud, Damselfly, LC50.

Six species of aquatic invertebrates including scud, daphnid, crayfish, aquatic sowbug, damselfly nymph, and a mayfly nymph were exposed to TFM in toxicity tests in hard water at 21C. The 96-hr LC50 of field grade TFM (35.7%) was 57.0 mg/liter for scud and 110 mg/liter for crayfish; purified TFM (95.7%) was twice as toxic. The thirty-day LC50 of field grade TFM was 14 mg/liter for scud and 20 mg/liter for crayfish. LC50 values are based on whole formulation rather than active ingredient. Accumulation experiments employed 14C ring labelled TFM. All organisms accumulated TFM within 7 days. No reproductive impairment occurred in daphnids exposed to 2.4, 4.9 and 10 mg/liter field grade TFM for three generations. Reproduction stopped within the first generation when exposed to 18 mg/liter. (Katz)
W75-10700

TOXICITY OF THE LAMPRICIDE 3-TRIFLUOROMETHYL-4-NITROPHENOL (TFM) TO THE NONTARGET FISH IN STATIC TESTS,
Bureau of Sport Fisheries and Wildlife, LaCrosse, Wis. Fish Control Lab.
L. L. Marking, and L. E. Olson.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402. In: Investigations in Fish Control, United States Department of the Interior, Fish and Wildlife Service, Washington, D.C. 1975, No 60. 27 p, 23 tab, 10 ref.

Descriptors: *Pesticides, *Toxicity, *Bioassay, *Lethal limit, *Salmonids, Water quality, Hardness(Water), Hydrogen ion concentration, Warm-Water fish, Cold-water fish, Temperature, Laboratory tests, Fish, Perches, Bass, Carp, Salmon, Trout, Mortality, Testing, Water pollution effects, Pollutant identification.
Identifiers: *Lampricides, *TFM, *Static tests, LC50.

The toxicity of 3-trifluoromethyl-4-nitrophenol (TFM) to 15 species of coldwater and warmwater nontarget fish was tested in static tests. The toxicity of TFM is influenced by temperature, water hardness and pH, with pH being the most influential factor. In laboratory test water, TFM detoxifies slowly; solutions loss little or no activity over periods up to 8 weeks. The margin of safety (LC01 for fish/LC99 for lamprey) for rainbow trout in minimum lampricidal concentrations of TFM is influenced by pH and is greater in water of low pH (6.5) than in water of higher pH. Under laboratory conditions at pH 7.5 and 8.5, a 10% mortality of rainbow trout could be expected in lampricidal concentrations of field grade TFM. (Katz)
W75-10701

TOXICITY OF THE LAMPRICIDE 3-TRIFLUOROMETHYL-4-NITROPHENOL (TFM) TO NONTARGET FISH IN FLOW-THROUGH TESTS,
Bureau of Sport Fisheries and Wildlife, LaCrosse, Wis. Fish Control Lab.
L. L. Marking, T. D. Bills, and J. H. Chandler.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402. In: Investigations in Fish Control, United States Department of the Interior, Fish and Wildlife Service, Washington, D.C., 1975, No 61, 9 p, 4 tab, 13 ref.

Descriptors: *Laboratory tests, *Toxicity, *Salmon, *Trout, *Pesticides, Brown trout, Rainbow trout, Shiners, Brook trout, Lake trout, Perches, Water quality, Sunfishes, Channel catfish, Mortality, Lethal limits, Hydrogen ion concentration, Hardness(Water), Water pollution effects, Pollutant identification.
Identifiers: Flow-through tests, *Lampricides, *TFM, *Coho salmon, Oncorhynchus kisutch, Salvelinus ssp., LC50.

Field grade 3-trifluoromethyl-4-nitrophenol (TFM) was tested for acute and chronic toxicity to 11 species of nontarget fish in 4- and 30-day exposures, respectively. The species used were coho salmon, rainbow trout, brown trout, brook trout, lake trout, goldfish, catfish, blue-gill, red-ear sunfish, and yellow perch. The toxicity of the TFM formulation to two species of salmonids did not change significantly (P=0.05) between 1- and 30-day exposures. The results of simultaneous static and flow-through acute toxicity tests with channel catfish were not significantly different in two experiments. (Katz)
W75-10702

TOXICITY OF THE LAMPRICIDE 3-TRIFLUOROMETHYL-4-NITROPHENOL (TFM) TO SELECTED AQUATIC INVERTEBRATES AND FROG LARVAE,
Bureau of Sport Fisheries and Wildlife, Warm Springs, Ga. Southeastern Fish Control Lab.
J. H. Chandler, and L. L. Marking.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402. In: Investigations in Fish Control, United States Department of the Interior, Fish and Wildlife Service, Washington, D.C. 1975, No 62, 7 p, 2 tab, 14 ref.

Descriptors: *Toxicity, *Pesticides, *Invertebrates, *Bioassay, *Frogs, Aquatic animals, Larval growth stage, Annelids, Shrimp, Mollusks, Lethal limit, Laboratory tests, Water pollution effects, Pollutant identification.
Identifiers: *TFM, *Lampricides, *LC50, Static tests, Flow-through tests, Soft-bodied invertebrates.

The lampricide 3-trifluoromethyl-4-nitrophenol (TFM) was tested against various groups of nontarget aquatic organisms. Flatworms, annelids, backswimmers, daphnids, seed and glass shrimps, bivalve mollusks, snails and mosquito larvae were among the invertebrates tested. Vertebrates exposed to TFM were larvae of gray tree frog, leopard frog and bullfrog. Larvae of tree frogs were the most sensitive organism to TFM (96-hr LC50 = 1.98 mg/l) and backswimmers were the least sensitive (96-hr LC50 = 555 mg/l). Soft-bodied invertebrates were less sensitive than snails and bivalve mollusks to TFM. The invertebrates tested were less susceptible to TFM than larval lampreys in similar tests. (Katz)
W75-10703

COMBINED EFFECTS OF CADMIUM AND SALINITY ON DEVELOPMENT AND SURVIVAL OF HERRING EGGS,
Biologische Anstalt Heigoland (West Germany).
H. Westerhhagen, H. Rosenthal, and K. R. Sperling.
Helgolander wissenschaftliche Meeresunters, Vol 26, p 416-433, 1974. 9 fig, 1 tab, 40 ref.

Descriptors: *Herrings, *Cadmium, *Bioassay, *Fish eggs, *Salinity, *Toxicity, *Immature growth stage, Saline water, Sea water, Brackish water, Embryonic growth stage, Hatching, Growth rates, Mortality, Absorption, Water pollution effects.
Identifiers: *Clupea harengus, Baltic herring.

Eggs of Baltic herring (Clupea harengus) were incubated in cadmium-contaminated water (0,0.1, 0.5, 1.0, 5.0 ppm) at four salinities (0.5 percent, 1.6 percent, 2.5 percent, 3.2 percent) in order to evaluate changes in cadmium toxicity. In diluted sea water deleterious effects of cadmium-contaminated water on herring embryos were more pronounced than in slightly brackish or natural sea water. Prehatching mortality and malformation rates were highest in the 0.5 percent salinity trials. The cadmium content of eggs was generally higher in lower salinities than in more saline water at comparable Cd concentrations. (Katz)
W75-10704

AN INVESTIGATION OF THE ECOLOGY AND WATER QUALITY OF A LAKE OUTLET,
Montana Univ., Missoula. Dept. of Zoology.
M. W. Oswood, and A. L. Sheldon.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-244 631, $3.75 in paper copy, $2.25 in microfiche. Research Report No 63, Montana University Joint Water Resources Research Center, Bozeman, January 1975. 35 p, 34 ref. OWRT A-072-MONT(1).

Descriptors: *Spatial distribution, *Ecological distribution, Ecology, *Eutrophication, *Water quality, *Nutrients, Outlets, Lakes, Seasonal, *Organic loading, *Biomass, *Aquatic algae, *Aquatic insects, Seston, Periphyton, Biological communities, Water pollution effects.
Identifiers: *Stream enrichment, Clearwater river system, Lake outlets, Enrichment, Hydropsychid caddis larvae.

A generalized hypothetical model of the lake outlet system includes the following features: (1) high densities of filter-feeders at the lake outlet are in part a response to high seston loads. Filter-feeder densities are determined by a complete feedback loop in which high densities of filter-feeders decrease seston load therby decreasing Hydropsychid densities. (2) There is a divergence of life history patterns in the Hydropsychids. (3) Filter-feeders appear to 'turn-over' nutrients in the seston, producing a pulse of nutrients in the region of high filter-feeder density. (4) Nutrients released are taken up by periphyton downstream from the outlet, therby increasing periphyton production downstream. (5) The outlet community forms an

extremely efficient filter of particulate organic material. As such, it is important in management of aquatic systems that such filters not be damaged by pollution or overloaded, in that a rapid decline in water quality downstream may result.
W75-10724

HEALTH IMPLICATIONS OF EXPOSURE TO TRACE METALS FROM COMBUSTION OF WASTE OIL,
Environmental Protection Agency, Washington, D.C.
K. Bridbord, A. Colucci, D. I. Hammer, and J. B. Moran.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer Incorporated, Washington, D.C., p 367-374, 1974. 2 tab, 15 ref.

Descriptors: Lead, *Public health, Oil wastes, Costs, Power plants, *Air pollution effects.
Identifiers: *Waste oil reuse, Health effects, *Lead pollution.

The health implications that would accompany use of waste oil as a primary fuel by blending with virgin fuel oil were examined, as well as economic aspects of this application. Lead levels were measured for El Paso where a population resides down wind from a smelter and in Philadelphia where children are exposed to high traffic density and industrial lead sources. To evaluate safe concentrations of waste oil in fuel for power plants, the considerations are: capacity of power plant; concentration of lead in the waste oil; frequency of waste oil combustion; fraction of lead emitted in waste oil; and, nature of the population contiguous to the power plant. No precise limit for allowable quantities of waste oil in power plant fuel has been specified. However, preliminary analysis, suggests that unless well regulated, the burning of waste oil in power plants could represent a serious hazard to populations residing in their vicinity due to lead emission levels. (See also W75-10739) (Prague-FIRL)
W75-10765

EFFECTS OF FARMING - URBAN DRAINAGE ON FRESH WATER,
Orange County Pollution Control Dept., Orlando, Fla.
For primary bibliographic entry see Field 5G.
W75-10802

SENSITIVITY OF HUMAN DIPLOID EMBRYONIC LUNG CELLS FROM ISOLATION OF ECHO VIRUSES FROM SEWAGE,
Ustav Hygieny, Prague (Czechoslovakia).
J. Zdrazilek.
Journal of Hygiene, Epidemiology, Microbiology and Immunology, Vol 18, No 1, p 2-8, 1974. 3 tab, 8 ref.

Descriptors: *Sewage, *Viruses, *Epidemiology, *Public health, *Pollutant identification, *Water pollution sources, Diseases, Cytological studies, Water pollution effects, Foreign research.
Identifiers: *Enteroviruses, Prague(Czech).

Enteroviruses from Prague, Czechoslavia, sewage samples were isolated on a strain of human diploid embryonic lung cells (HDLC) and on secondary monkey kidney cell cultures (MKC). The sewage samples were obtained from ten Prague nursery schools and two main sewers of the city. Thirty-six poliovirus strains of each of the three types and 47 ECHO virus strains were isolated. Twenty-four of the poliovirus strains had a cytopathic effect on the MKC cultures only, while 31 ECHO virus strains had a cytopathic effect on HDLC cultures, and 12 others produced a cytopathic effect on both kinds of cells. The parallel titration of the ECHO virus strains isolated on HDLC and MKC determined that most of the strains, on the type of cells on which the virus strains were found, produced a cytopathic effect. The possibility was considered that a greater resistance of HDLC to the non-viral toxicity of some sewage samples influenced the success of the isolation of enteroviruses. (Leibowitz-FIRL)
W75-10836

GROUNDWATER PROTECTION IN HIGHWAY CONSTRUCTION IN THE CATCHMENT AREA OF THE CITY OF BERNE AT KIESEN (GRUNDWASSERSCHUTZ BEIM AUTOBAHN IM FASSUNGSGEBIET STADT BERN IN KIESEN),
H. Geiser.
Gas Wasser Abwasser, Vol 54, No 9, p 385-392, September, 1974. 7 tab, 4 ref.

Descriptors: *Highway effects, *Groundwater, *Construction, Oil wastes, Bacteria, Municipal water, Water pollution effects, Water pollution sources.
Identifiers: Berne(Germany), Groundwater contamination.

The effect of turnpike construction on groundwater quality in the catchment area of the city of Berne at Kiesen, and measures taken to prevent groundwater contamination in the protected zone along the turnpike, are described. Highway construction operations, including those involving vibrations, caused a temporary impairment of the groundwater that had originally been of high quality, resulting in a general rise in both the germ count and in the appearance of Coliform bacteria. The water quality returned to normal after completion of the turnpike construction. As it was impossible to bypass the protected zone, groundwater contamination due to spilled gasoline, oil, and other chemicals will be prevented by a tight drain system for water from the turnpke into an oil separation tank, from which the cleaned water is discharged directly into a river. (Takacs-FIRL)
W75-10837

THE EFFECT OF PROLONGED EXPOSURE TO ELEVATED TEMPERATURES ON THE BIOCHEMICAL CONSTITUENTS, GONADAL DEVELOPMENT AND SHELL DEPOSITION OF THE AMERICAN OYSTER, CRASSOSTREA VIRGINICA,
Connecticut Univ., Noank. Marine Research Lab.
G. M. Ruddy, S. Y. Feng, and G. S. Campbell.
Comp. Biochem. Physiol., Vol 51 B, p 157-164, 1975. 10 fig, 26 ref. OWRT A-040-CONN(2). 14-31-0001-3207.

Descriptors: *Aquiculture, Shellfish farming, *Oysters, Powerplants, *Heated water, Biochemistry, Water pollution effects, *Thermal pollution.
Identifiers: *Gonadal development, Condition index, Shell deposition, Crassostrea virginica.

This study was designed to determine how oysters raised in the heated effluent of a power plant compare in quality, gonadal development and shell deposition with their controls maintained at ambient temperatures. The oysters in the heated effluent averaged 56% higher in protein concentration, 109% higher in carbohydrate concentration and 22% higher in condition index that the control oysters during the winter and spring months. The warm temperatures in the discharge canal during this period (14-19C) permitted the oysters to feed during the very large spring phytoplankton bloom, while the control oysters in the ambient temperature (2-7C) remained relatively inactive. During the summer months, the control oysters attained levels of protein, carbohydrate and condition index that were similar to those of the warm-water grown oysters. The development of the gonads of the oysters in the heated effluent occurred 4 months earlier than the controls, but spawning took place only 1 month earlier. The warm-water grown oysters produced thicker shells than the control oysters. (deLara-Connecticut)
W75-10849

THE EFFECT OF THE QUANTITY OF SILT TO THE ATTACHED MICROORGANISMS OF THE KUZURYU-GAWA RIVER IN THE HOKURIKU DISTRICT, (IN JAPANESE),
Kanagawa Univ. (Japan). Biology Inst.
T. Watanabe, and H. Kamijo.
Japanese Journal of Limnology, Vol 35, No 2, p 73-81, 1974; 2 fig, 5 tab, 4 ref.

Descriptors: *Sampling, *Laboratory tests, *Silts, *Primary productivity, Water quality, Water pollution sources, *Microorganisms, *Bacteria, *Diatoms, *Sessile algae, *Cyanophyta, *Chlorophyta, *Bioassay, *Bioindicators, Environmental effects, Limnology, Hydrogen ion concentration, Temperature, Conductivity, Turbulence, Domestic wastes.
Identifiers: Biological assessments, Ignition residue, Ignition loss.

The microorganisms attached to stones and other materials were collected at 17 stations on the Kuzuryu-gawa River and examined. A biological assessment was made which included bacteria, diatoms, blue-green algae, and green algae. Water temperature, pH, electric conductivity, turbidity, and standing crops of microorganisms (represented by ignition loss) were determined. The quantity of silt covering the river bed was surveyed in regard to its effect on the attached microorganisms in areas of both domestic waste pollution and non-pollution. (Katz)
W75010696

5D. Waste Treatment Processes

CORROSION AND ITS COST IN SEWAGE TREATMENT,
For primary bibliographic entry see Field 8G.
W75-10364

PROBLEMS OF SPACE BIOLOGY. VOLUME 24. THE WATER SUPPLY OF SPACECRAFT CREWS,
S. V. Chizhov, and Yu. Ye. Sinyak.
Available from the National Technical Information Service, Springfield, Va. 22161, as N74-18795, $7.50 in paper copy, $2.25 in microfiche. Translation of Problemy Kosmicheskoy Biologii. Tom XXIV, Vodoobespecheniye Ekipazhey Kosmicheskikh Korabley, Nauka Press, Moscow, 1973. 268 p, 57 fig, 418 ref, 61 tab.

Descriptors: *Water supply , Water quality, Water conservation, *Water reuse, *Recycling, Reclaimed water, Waste water(Pollution), Ion exchange, Membrane processes, Water treatment, Odor, Sewage, Sewage treatment, *Waste water treatment, Urine, Potable water, Satellites(Artificial), Biology, *Resins.
Identifiers: *Spacecraft, Perspiration, Feces, *Ion exchange resins.

The problem of water supply aboard a spacecraft is discussed together with probable solutions. The medical and technical characteristics of the design of water supply systems for spacecraft are considered, with emphasis on water quality and conservation of drinking water. Various methods of regenerating water from moisture-containing products (feces, urine, and perspiration) of human vital activity and recycling of water used for sanitary and hygienic purposes are examined. Considerable attention is devoted to the regeneration of water by ion-exchange resins and absorbent materials, as well as semipermeable membranes. The problems involved in decontaminating and deodorizing recycled water are examined in detail. (Witt-IPC)
W75-10365

STUDY OF SOLID WASTE MANAGEMENT PRACTICES IN THE PULP AND PAPER INDUSTRY.
Gorham International, Inc., Maine.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-234 944, $7.00 in paper copy, $2.25 in microfiche. February 1974. 196 p, 17 fig, 20 ref, 11 tab.

Descriptors: *Pulp and paper industry, *Solid wastes, *Management, Water pollution sources, Waste disposal, Wood wastes, *Waste water treatment, Sludge, Economics, *Waste treatment, Wastes, Industrial wastes, Pollutants, Water pollution control, *Pulp wastes.
Identifiers: Waste paper, Chemical pulping, Mechanical pulping, Papermaking, Kraft mills, Sulfite mills, Coated papers, Uncoated papers, Kraft linerboard, Corrugating medium, Kraft pulps, Neutral sulfite semichemical pulps, Deinking mills.

The structure of the pulp and paper industry is reviewed, including pulps used for papermaking, production processes (pulping, pulp bleaching, and papermaking), paper products, industry production, and considers solid waste generation points and characteristics, solid waste management practices, and estimates the quantities of solid wastes generated in wood processing, power generation, waste water treatment, waste paper reclamation, pulping (chemical and mechanical), and specialty paper products manufacture. The economics of solid waste management and the impact of environmental legislation on solid waste management are discussed. Alternatives for existing solid waste management practices are examined. Case studies are presented showing solid waste management practices at mills producing bleached kraft pulp, paperboard, and converted paper products; neutral sulfite semichemical pulp, waste paper pulp, and corrugating medium; bleached kraft pulp and coated and uncoated papers; groundwood and bleached sulfite pulps and coated and uncoated papers; and unbleached kraft pulp and linerboard. (Witt-IPC)
W75-10366

REDUCTION OF EFFLUENT POLLUTION AT THE ARKHANGEL'SK MILLS (SNIZHENIE ZAGRYAZNENNOSTI STOCHNYKH VOD NA ARKHANGEL'-SKOM KOMBINATE),
Arkhangelsk Kombinat (USSR).
A. M. Rudakova.
Bumazhnaya Promyshlennost, No 3, p 23-24, March 1975.

Descriptors: *Water pollution control, *Pulp and paper industry, *Waste water treatment, *Water consumption, Sulfite liquors, Pulp wastes, Biological treatment, Sludge treatment, Dewatering, Drying, Evaporation, Water purification, Foreign countries, Pollution abatement, Water pollution sources, Industrial wastes, Wastes, Waste treatment, Recycling, Water conservation, Industrial water.
Identifiers: Woodroom effluents, Paper mills, Board mills, Soviet Union(USSR).

The Arkhangel'sk mill is actively engaged in research on pollution abatement. During the last decade large sums were invested in effluent purification equipment and much work had been done to reduce the volume of effluents as well as their pollution load. The capacity of the biological purification plant has been increased, a plant for dewatering and thermal drying of sludge has been constructed, the evaporation plant has been modernized to permit the full utilization of spent pulping liquors, including spent liquor from the neutral sulfite semichemical process, and equipment has been installed for the purification of bark-containing effluent from the wood preparation room. At the paper and board mills the consumption of fresh water has been reduced. (Stapinski-IPC)
W75-10368

INCREASING THE EFFICIENCY OF FLOTATION SAVEALLS (POVYSHENIE EFFEKTIVNOSTI RABOTY FLOTATSIONNYKH LOVUSHEK),
Ukrainskii Nauchno-Issledovatelskii Institut Bumagi, Kiev (USSR).
V. A. Kopylov, V. G. Pivovarov, and R. A. Solonitsyn.
Bumazhnaya Promyshlennost, No 3, p 21-23, March, 1975. 1 fig, 6 ref, 1 tab.

Descriptors: *Efficiencies, *Waste water treatment, *Flotation, Waste treatment, *Performance, Optimization, Water pollution treatment, Water purification, Sewage treatment, Air, Equipment, Valves, Construction, Design, Separation techniques, Water pollution treatment, Water pollution control, Filters, Aeration.
Identifiers: *Savealls.

An analysis of the operation of flotation savealls operating on the principle of pressure flotation has shown that the cause of the low efficiency of this type of equipment is an insufficient amount of air bubbles in the flotation part where the bubble-particle complexes rise to the surface. This is due mainly to insufficient air dissolved in the effluent, inadequate construction of the reducing valve which lowers the effluent pressure to atmospheric, intense coalescence of air bubbles in the receiving chamber, and strong currents generated when the effluent goes from the receiving chamber to the floatation chamber. The construction decribed in this article eliminates the above drawbacks and increases the efficiency of existing savealls. To dissolve air in the effluent and remove the excess air, a head tank was developed which makes it possible to fully saturate the effluent within 1-2 min. A specially constructed reducing valve corrected the problem of lowering the pressure to atmospheric and a redesigned receiving chamber shortened the residence time of the aerated effluent in the chamber to 3-5 sec, so that no coalescence of the air bubbles takes place. The efficiency of the savealls has bee increased from 50-79% to 85-96%. A diagram of the new saveall is given. (Stapinski-IPC)
W75-10369

ACTIVATED SLUDGE,
California Univ., Davis.
E. D. Schroeder.
Journal Water Pollution Control Federation, Vol 47, No 6, p 1261-1269, June, 1975. 101 ref.

Descriptors: *Reviews, *Bibliographies, *Activated sludge, *Waste water treatment, Industrial wastes, Phosphorus, Nitrogen, Nutrient removal, Design, Operations, Mathematical models, Aeration, Waste treatment, Water pollution control, Pulp wastes, Control, Heavy metals, Biochemistry, Microbiology, Toxins, Sludge treatment, Sludge disposal, Economics, Costs.

The 1974 literature on the treatment of waste waters by the activated sludge process is reviewed. Topics discussed include: process models, control, and design and operation of activated sludge plants; microbiology and biochemistry of the process; removal of heavy metals and effects of toxicants; industrial waste water treatment; aeration; nitrogen and phosphorus removal; sludge thickening and disposal; and costs of activated sludge plants. Refinery, pulp and paper, and distillery wastes are cited as examples of some of the waste materials that are being treated by the activated sludge process. (Witt-IPC)
W75-10371

WASTE WATER TREATMENT: WATER RECLAMATION AND REUSE,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
I. J. Kugelman, and J. N. English.
Journal Water Pollution Control Federation, Vol 47, No 6, p 1338-1344, June, 1975. 76 ref.

Descriptors: *Reviews, *Bibliographies, *Water reuse, *Reclaimed water, Planning, Groundwater recharge, Potable water, Industrial water, Waste water treatment, Municipal water, Water resources, Water conservation, Water utilization, Effluents, Pulp and paper industry, Recycling.

The 1974 literature on water reclamation and reuse is reviewed. The topics covered include: reuse in water resources planning, industrial reuse of water (e.g., recycling water in the pulp and paper industry), reuse of treated waste water for irrigation and groundwater recharge domestic reuse, and reuse technology development (advanced waste water treatment methods applicable to the production of reusable water). (Witt-IPC)
W75-10372

WASTE WATER TREATMENT: LAND DISPOSAL OF WASTE WATER,
New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 5E.
W75-10373

WASTE WATER TREATMENT: LAGOONS AND OXIDATION PONDS,
Kansas Univ., Lawrence.
W. J. O'Brien.
Journal Water Pollution Control Federation, Vol 47, No 6, p 1269-1273, June, 1975. 37 ref.

Descriptors: *Reviews, *Bibliographies, *Aerated lagoons, *Oxidation lagoons, *Waste water treatment, Industrial wastes, Municipal wastes, Water pollution control, Lagoons, Sewage treatment, Waste treatment.

The 1974 literature on the use of aerated lagoons and oxidation ponds for the treatment of industrial and municipal waste waters is reviewed. (Witt-IPC)
W75-10374

CELLULOSE DEGRADATION IN WASTE WATER TREATMENT,
Uppsala Univ. (Sweden). Inst. of Biochemistry.
N. Edberg, and B. V. Hofsten.
Journal Water Pollution Control Federation, Vol 47, No 5, p 1012-1020, May, 1975. 12 fig, 19 ref, 1 tab.

Descriptors: *Cellulose, *Biodegradation, *Waste water treatment, Bacteria, Organic compounds, Degradation(Consumption), Water pollution sources, Activated sludge, Fibers(Plant), Lignins, Testing procedures, Gravimetric analysis, Oxygen demand.
Identifiers: Sulfite pulp.

A considerable part of the organic matter in municipal waste water consists of cellulose fibers. A method of studying the bacterial degradation of these fibers has been developed. Sample fibers (sulfite pulp fibers) are enclosed in an inert nylon bag and immersed in environments encountered in an activated sludge process. The amount of degradation is determined by periodically retrieving the bags and weighing them. Such experiments show that degradation of cellulose fibers results in increased oxygen consumption. Fibers that are slowly degraded because of high lignin content or slow bacterial growth play only a minor role in the oxygen balance. (Witt-IPC)
W75-10376

WISCONSIN TISSUE MILLS ONE YEAR AFTER STARTUP OF THE EFFLUENT PLANT,
Wisconsin Tissue Mills, Neenah, Wis.
W. Rice, and R. Van Soest.
In: TAPPI Environmental Conference, Denver, Colorado, May 14-16, 1975, Preprinted Proceedings (TAPPI, Atlanta, Georgia), p 197-205, 3 fig, 4 tab.

Descriptors: *Pulp wastes, *Treatment facilities, *Pulp and paper industry, *Waste water treatment, *Wisconsin, Capital costs, Operating Costs, Costs, Operation and maintenance, Sulfur compounds, Odor, Anaerobic conditions, Degradation(Decomposition), Hydrogen ion concentration, Dissolved oxygen, Biological treatment, Industrial wastes, Wastes, Waste treatment, Water pollution sources, Water pollution treatment, Water pollution control.
Identifiers: *Zurn-Attisholz process, Hydrogen peroxide, Sodium hypochlorite, Tissue paper, Tissue mills, Waste paper, Deinking wastes.

The Zurn-Attisholz process has been operational at Wisconsin Tissue Mills (Neenah, Wisconsin) for more than one year with satisfying results. Capital and operating costs of the system are detailed. Operational experiences indicate that deinking wastes contain sufficient sulfur compounds to cause odor generation if prolonged anaerobic conditions are encountered. Odors from sulfur decomposition can be controlled by high pH, proper dissolved oxygen level, hydrogen peroxide or sodium hypochlorite, and also by biological means. A brief description of the effluent treatment plant is included. Wisconsin Tissue Mills manufactures tissue paper mainly from waste paper. (Sykes-IPC)
W75-10378

EFFECT OF TEMPERATURE AND SLUDGE LOADING ON 5-DAY BOD REMOVAL AND SLUDGE SETTLEABILITY IN ACTIVATED SLUDGE SYSTEMS TREATING BLEACHED KRAFT EFFLUENTS,
B.C. Research Ltd., Vancouver.
E. G-H. Lee, J. C. Mueller, and C. C. Walden.
Tappi, Vol 58, No 6, p 100-103, June, 1975. 6 fig, 10 ref, 2 tab.

Descriptors: *Pulp wastes, *Bleaching wastes, *Activated sludge, *Waste water treatment, Temperature, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Waste treatment, Effluents, Biological treatment, Microorganisms, Foods, Suspended solids, Protozoa, Water pollution control, *Biochemical oxygen demand, Zooplankton, Aquatic life, Aquatic microorganisms.
Identifiers: Kraft mills.

Removal of BOD, sludge settling characteristics, and changes in zooplanktonic populations were evaluated as functions of food/microorganisms (F/M) ratios ranging from 0.1 to 2.4 and temperatures of 16-40 C is six laboratory activated sludge systems. Overall BOD removal was good at all temperatures and F/M, ratios; a slight drop occurred when temperature and F/M ratios were increased. Temperature significantly affected sludge settleability, although F/M ratios did not. The proportion of nonsettleable mixed liquor suspended solids and the suspended solids in the effluents tripled as the temperature was increased from 16 to 36 C at all F/M ratios. Sludge volume indices showed little variation with changes in temperature of F/M ratio, whereas significant changes in zooplanktonic populations were observed with increasing temperature. The largest populations of protozoa and metozoa occurred at 16 and 30C but were significantly reduced at 36C and virtually disappeared at 40C. (Sykes-IPC)
W75-10379

TAIO PAPER (COMPANY, IYOMISHIMA, JAPAN) EXPANDS TO 1,000,000 TONS/YEAR,
J. C. W. Evans.
Pulp and Paper International, Vol 17, No 5, p 45-47, 50, May, 1975. 5 illus.

Descriptors: *Pulp wastes, *Waste water treatment, *Water reuse, Recycling, Pulp and paper industry, Foreign countries, Asia, Settling basins, Suspended solids, Activated sludge, Aerated lagoons, Filtration, Water purification, Water conservation, Water consumption(Except consumptive use), Water pollution control, Pollution abatement, Water supply, Treatment facilities, Water pollution treatment.
Identifiers: *Japan, Alum, Sodium hydroxide, Wood supply, Mill site, Linerboard mill, Newsprint mill, Kraft linerboard, Newsprint, Board mills.

A new mill producing virgin kraft linerboard and newsprint was built on Shikoku Island beside the existing mill of Taio Oaper Co. which produces corrugating medium and fine papers in addition to linearboard and newsprint. Major problems dealt with before the expansion included wood supply, mill site, fresh water supply, and effluent treatment. Wood is imported from the U.S. Pacific Northwest, Australia, U.S.S.R., and Southeast Asia. A mill site was obtained by dredging and building on reclaimed land. Additional fresh water was not readily available, but installation of extensive effluent treatment systems permitted reuse of much of the water. The effluent intended for recycling is first sent to a settling basin for reduction of suspended solids and then to an activated sludge aeration basin. It then passes through two second-stage settling basins where alum, caustic soda, and flocculating agents are added. The effluent for recycling is then sent to a filter. The remaining effluent goes to two clarifiers where insoluble compounds which precipitate out as a result of the chemical reactions are removed. Treatment of effluent for discharge into the sea is similar but with elimination of the activated sludge treatment. Fresh water consumption has been reduced by one-half, i.e., to 35 cu m/ton of finished paper, after installation of these treatment systems. (Sykes-IPC)
W75-10380

ANALYTIC CHARACTERIZATION OF SEWER LOADING BY SPENT LIQUORS OF THE PULP INDUSTRY (ANALYTISCHE KENNZEICHUNG DER BELASTUNG DER VORFLUTER DURCH ABLAUGEN DER ZELLSTOFFINDUSTRIE),
W. Leithe.
Das Papier, Vol 29, No 5, p 195-197, May, 1975. 1 ref.

Descriptors: *Pulp wastes, *Biochemical oxygen demand, *Chemical oxygen demand, Analytical techniques, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Oxidation, Waste water(Pollution), Water pollution, Organic loading, *Pollutant identification, *Waste water treatment.
Identifiers: Total organic carbon.

Spent liquors from pulp production burden the effluent predominantly via the oxygen demand during biological decomposition of organic material. For rapidly decomposing materials, especially carbohydrates, 5-day DOD determination is applied, for which a simplified differential method is indicated. For the determination of the total (long-term) oxygen demand (COD), the postassium dichromate method is adequate. A value especially suited for relative determinations is the total organic carbon content (TOC value). It advantage consists in the short testing time and the completeness of the oxidation. However, a direct comparison with the 5-day BOD is not possible, since the COD/TOC relationship is variable. (Speckhard-IPC)
W75-10381

STUDIES ON POSSIBILITIES OF BIOCHEMICAL PURIFICATION OF EVAPORATOR CONDENSATE OCCURRING DURING SULFITE PULP MANUFACTURE (UNTERSUCHUNGEN UEBER DIE MOEGLICHKEIT DER BIOCHEMISCHEN REINIGUNG DES BEI DER SULFITZELLSTOFFHERSTELLUNG ANFALLENDEN EINDAMPFKONDENSATES),
Technische Universitaet, Dresden (East Germany).
H.-J. Walther, and D. Knaack.
Fortschritte der Wasserchemie und Ihrer Grenzebiete, Vol 15, p 251-272, 1973. 1 fig, 26 ref, 4 tab.

Descriptors: *Activated sludge, *Waste water treatment, *Pulp wastes, *Sulfite liquors, Industrial wastes, Water pollution sources, Pulp and paper industry, *Biological treatment, Digestion, Waste dilution, Phosphorus, Nitrogen, Water pollution control, Waste treatment, Biodegradation, Microbial degradation.
Identifiers: *Evaporator condensates, Acetic acid, Formic acid, Furfural, Sulfur dioxide, Sulfite pulp mills.

Studies are reported concerning biochemical treatment (activated sludge process) of evaporator condensates from sulfite pulping using a model condensate containing acetic acid, formic acid, furfural, and sulfur dioxide. The condensate was shown to be highly digestible following dilution in the presence of a nitrogen and phosphorus source, although the morphology of the biological system was changed considerable from the conventional concept of an activated sludge process. Furfural, which should be regarded as especially dangerous with respect to effects on receiving waters, was completely eliminated by the biochemical treatment. (Speckhard-IPC)
W75-10382

USE OF ORGANIC FLOCCULANTS FOR TEXTILE PLANT WATER TREATMENT (POUZITI ORGANICKYCH FLOKULANTU K CIRENI VODY PRO TECHNOLOGII TEXTILNI VYROBY),
For primary bibliographic entry see Field 5F.
W75-10383

NEW LEGISLATIVE TENDENCIES FOR CONTROL OF WATER POLLUTION (NUEVAS TENDENCIAS LEGISLATIVAS EN EL CONTROL DE LA CONTAMINACION DE LAS AGUAS),
Centros de Estudios, Investigaciones y Aplicaciones del Agua, Granada (Spain).
For primary bibliographic entry see Field 5G.
W75-10384

SERPAFLO: ORIGINAL SOLUTION TO CLEANING PAPER MILL EFFLUENTS (SERPAFLO; LA SOLUTION ORIGINALE D'EPURATION DES EAUX PAPETERIES),
J. Moreau.
La Papeterie, Vol 97, No 5, p 281-287, May, 1975. 13 fig.

Descriptors: *Waste water treatment, *Pulp wastes, *Flotation, Wastes, *Industrial wastes, Water pollution sources, Water pollution treatment, Water purification, Recycling, Water reuse, Equipment, Performance, Sewage treatment, Tertiary treatment, Effluents, Design, Treatment facilities, Waste treatment, *Cleaning.
Identifiers: *Serpaflo, Fiber recovery, Filler recovery, Paper machines, White water.

After discussing in some detail the general characteristics of paper mill effluent treatment (including fiber and filler recovery, purification of effluent from the paper machine secondary and tertiary circuits, and recycling of clarified water), the design and performance characteristics of the (Serpaflo' flotation unit are examined. The unit can be used in treating both secondary and tertiary effluents in the paper mill. (Speckhard-IPC)
W75-10389

ROTATING BIOLOGICAL DISK TREATMENT OF KRAFT MILL EFFLUENTS,
B. C. Research Ltd., Vancouver. Div. of Applied Biology.
E. G-H. Lee, and J. C. Mueller.
Water Pollution Control, Vol 113, No 5, p 25-29, May, 1975. 8 fig, 5 ref, 1 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Biological treatment, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Laboratory tests, Biochemical oxygen demand, Suspended solids, Toxicity, Fish, Efficiencies, Operation and maintenance, Sludge, Foaming, Capital costs, Costs, Waste treatment, Water pollution control, Water purification, Reliability, Performance, Equipment.
Identifiers: *Rotating biological disk.

The rotating biological disk (RBD) system offers a novel technique for the treatment of kraft mill effluents. It combines simplicity, reliability, and efficiency of operation into one system. To verify the advantages claimed by this system, a laboratory study was undertaken with a 7 liter bench-scale RBD unit. Combined bleached kraft mill effluents (5-day BOD = 165 to 185 mg/liter) were tested at retention times of 2 to 16 hr, equivalent to hydraulic loadings of 0.26-0.33 gal/sq ft/day, respectively. The BOD removal was better than 90%. The BOD of the treated effluent was less than 20 mg/liter and the suspended solids content was less than 33 mg/liter throughout. All acute toxicity to fish was removed at retention times as short as 2 hr. The high efficiency obtained implies that the system could handle loadings larger than 0.00046 lb BOD/sq ft/day without significant change in effluent quality. The RBD system was simple to operate requiring little attention. Sludge built up rapidly on the disk surface. No foaming problems occurred and no sludge washout was experienced. Capital costs for a 10 million gal/day plant are $6000,000-1,000,000. (Witt-IPC)
W75-10390

SPENT LIQUOR FROM PEROXIDE BLEACHING OF GROUNDWOOD PULP FROM SPRUCE,
Chalmers Univ. of Technology, Goteborg (Sweden). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5A.
W75-10392

COLOR OF PULP INDUSTRY WASTE LIQUORS. (6). BEHAVIOR OF COLOR DURING WASTE TREATMENTS (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan).
K. Sameshima, T. Ishizaki, M. Sumimoto, and T. Kondo.
Journal of the Japan Wood Research Society (Mokuzai Gakkaishi), Vol 21, No 3, p 182-187, March 1975. 5 fig, 11 ref, 4 tab.

Descriptors: *Pulp wastes, *Color, *Bleaching wastes, *Waste water treatment, Industrial wastes, Wastes, Waste treatment, Hydrogen ion concentration, Dialysis, Activated carbon, Adsorption, Coagulation, Lime, Activated sludge, Sulfite liquors, Water pollution sources, Water pollution treatment, Pulp and paper industry.
Identifiers: Alum.

Effluents from bleached and unbleached kraft and sulfite cooks were treated for color removal by pH adjustment, dialysis, activated carbon adsorption, alum coagulation, lime treatment, and activated sludge treatment. The color of all waste waters changed over all pH ranges. Dialysis indicated that color substances in bleaching wastes have higher molecular weights than those in pulping effluents. Alum and lime treatments effectively removed bleaching and kraft effluent color. Activated carbon was most effective in decoloring neutral sulfite semichemical effluents. Activated sludge treatment of pulping wastes intensified rather than diminished the color. In general color bodies of all wastes did not parallel the other characteristics of the effluents, such as Mn-based COD, 5-day BOD, and absorbance at 280 nm. (See also W75-10394, W75-01271, W74-12924, W74-04512, W73-01428, and W73-15189) (Brown-IPC)
W75-10393

COLOR OF PULP INDUSTRY WASTE LIQUORS. (7). COLOR REDUCTION BY ULTRAVIOLET TREATMENT (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan).
K. Sameshima, M. Sumimoto, and T. Kondo.
Journal of the Japan Wood Research Society (Mokuzai Gakkaishi), Vol 21, No 3, p 188-193, March 1975. 12 fig, 14 ref, 1 tab.

Descriptors: *Pulp wastes, *Color, *Ultraviolet radiation, *Waste water treatment, Wastes, Industrial wastes, Water pollution sources, Sulfite liquors, Bleaching wastes, Pulp and paper industry, Chemical oxygen demand, Hydrogen ion concentration, Lignins, Water pollution control, Water pollution treatment, Waste treatment, Acids, Degradation(Decomposition).

Nine types of wood cooking and bleaching wastes were irradiated with ultraviolet radiation (mercury lamp) to reduce their color. Color reductions varied with different wastes. The colors of kraft and sulfite mill effluents were intensified at the start of irradiation, then reduced. Sulfite effluents decolored faster than kraft effluents. The colors of bleaching and neutral sulfite semichemical effluents were reduced from the start of irradiation. The Mn-based COD and absorbance at 280 nm of all wastes were reduced from the start. The pH of irradiated wastes dropped at the start, showing formation of some acids, and then rose gradually with further degradation of acids. Isolated lignin preparations subjected to the same treatment showed the same patterns of color reduction as the original wastes. (See also W75-10393, W75-01271, W74-12924, W74-04512, W73-01428, and W73-15189) (Brown-IPC)
W75-10394

WASTE WATER TREATMENT: SLUDGE TREATMENT, UTILIZATION, AND DISPOSAL,
Delaware Univ., Newark. Dept. of Civil Engineering.
R. I. Dick.
Journal Water Pollution Control Federation, Vol 47, No 6, p 1306-1323, June 1975. 255 ref.

Descriptors: *Reviews, *Bibliographies, *Sludge treatment, *Sludge disposal, Sludge, Dewatering, Incineration, Industrial wastes, Drying, Water treatment, *Waste water treatment, Properties, Toxins, Nutrients, Nutrient removal.

The 1974 literature on the treatment, utilization, and disposal of sludges from waste water treatment and water treatment plants is reviewed. The topics covered include: sludge properties; toxic, industrial, nutrient-laden, and water treatment sludges; conditioning; thickening; dewatering; combustion and heat drying; reclamation; and ultimate disposal. (Witt-IPC)
W75-10395

PROCESS DESIGN MANUAL FOR UPGRADING EXISTING WASTE WATER TREATMENT PLANTS.
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
Environmental Protection Agency, Technology Transfer. October 1974. 394 p, 78 fig, 105 tab, 371 ref.

Descriptors: *Treatment facilities, *Municipal wastes, *Publications, Waste treatment, Water pollution treatment, *Costs, Equipment, Organic loading, *Operations, *Waste water treatment, Water pollution sources, Water pollution control, Facilities.

Situations that necessitate upgrading of existing municipal waste water treatment plants are examined, and the corrective actions that are required to upgrade these existing plants are discussed and evaluated. Upgrading to overcome organic and hydraulic overloadings and/or to meet more stringent treatment requirements is considered. The manual emphasizes that operational improvement and modifications to existing unit operations be considered as the logical initial approach to upgrading existing treatment plants, before major expansion of facilities is implemented. The capabilities, limitations, and interrelationships of the various unit operations commonly used in municipal waste water treatment plants are examined in depth. Hypothetical situations requiring upgrading of unit operations are also examined and costs associated with the upgrading are described. One chapter presents case histories of upgrading of existing treatment plants to illustrate the approaches actually used in these circumstances. (Witt-IPC)
W75-10396

INDUSTRIAL WASTES: PAPER AND ALLIED PRODUCTS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
G. W. Gove, and I. Gellman.
Journal Water Pollution Control Federation, Vol 47, No 6, p 1402-1446, June 1975. 298 ref.

Descriptors: *Reviews, *Bibliographies, *Pulp and paper industry, *Waste water treatment, Water quality standards, *Pulp wastes, Economics, Capital costs, Industrial wastes, Water pollution sources, Analytical techniques, Membrane processes, Alcohols, Sulfite liquors, Water conservation, Water reuse, Irrigation, Lime, Color, Water pollution, Activated carbon, Ozone, Coagulation, Filtration, Waste treatment, Aerated lagoons, Activated sludge, Sludge treatment, Sludge disposal, Water pollution control, Water pollution effects.
Identifiers: Chemical recovery, Sulfate soap, Tall oil, Turpentine, Black liquor, Kraft mills.

The 1974 literature on the treatment of wastes from the manufacture of pulp and paper and allied products is reviewed. It covers United States government policies regarding waste water treatment; the cost of meeting the water quality regulations; sources and treatment of effluents in the pulp and paper industry; effects of paper industry wastes on receiving streams; instrumentation for monitoring paper mill effluents; effluent analysis techniques; chemical recovery from effluents via membrane processes; by-product recovery (including alcohol by fermentation of yeast on spent sulfite liquor, chemical recovery from spent sulfite liquors, and sulfate soaps, tall oil, and turpentine from kraft mill effluents); solids recovery from and renovation and reuse of pulping and papermaking effluents; color reduction of kraft pulp mill effluents by treatment with lime, activated carbon and ozone and by chemical coagulation, filtration, flotation and ion-exchange processes; sludge dewatering and disposal; and secondary effluent treatment (activated sludge plants, aerated stabilization basins, rotating biological disks, and land irrigation). (Witt-IPC)
W75-10397

PROBLEMS ENCOUNTERED IN SLUDGE TREATMENT AND SOME ADVANCED SOLUTIONS,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 5E.
W75-10398

COLOR REMOVAL FROM BLEACHED KRAFT EFFLUENTS,
Dow Chemical Co., Midland, Mich.
T. A. Chamberlin, G. C. Kolb, S. F. Brown, and D. H. Philp.
In: TAPPI Environmental Conference, Denver, Colorado, May 14-16, 1975, Preprinted Proceedings (TAPPI, Atlanta, Georgia), p 35-45. 13 fig, 19 ref, 6 tab.

Descriptors: *Pulp wastes, *Color, *Ion exchange, *Waste water treatment, Wastes, Industrial wastes, Water pollution sources, Sulfite liquors, Bleaching wastes, Waste treatment, Chemical oxygen demand, Fish, Toxicity, Separation techniques, Water pollution treatment, Resins, Water purification, Water quality control, Computer programs.
Identifiers: Resin XD-8704.

The reduction of color, COD, and fish toxicity in kraft bleach, decker, and neutral sulfite semichemical effluent streams with resins is discussed, based on results of field and laboratory investigations. The contaminants are removed from the process streams by Dow Chemical Co.'s experimental resin XD-8704 in the pH range 2-9. Regeneration is accomplished by treating the resin with weak wash water followed by effluent from the chlorination stage. Experimental field data are being gathered by an on-site automated mini-plant treating effluent from the caustic extraction and chlorination stages (the pH is controlled by appropriate combination of the two effluent streams). A computer program is being developed to determine the economics involved for various sets of process parameters (pH and temperature of the resin and process effluent, residence time, and effluent content). (Sykes-IPC)
W75-10399

ANALYSIS OF ALTERNATIVES FOR REMOVAL OF SUSPENDED SOLIDS IN PULP AND PAPER MILL EFFLUENTS,
Great Southern Paper Co., Cedar Springs, Ga.
O. D. Smith, R. M. Stein, and C. E. Adams, Jr.
In: TAPPI Environment Conference, Denver, Colorado, May 14-16, 1975, Preprinted Proceedings (TAPPI, Atlanta, Georgia), p 85-96. 7 fig, 1 ref, 4 tab.

Descriptors: *Pulp wastes, *Suspended solids, *Waste water treatment, Wastes, Industrial wastes, Water pollution sources, Coagulation, Filtration, Sedimentation, Costs, Economics, Water purification, Water pollution treatment, Water pollution control, Pulp and paper industry, Aerated lagoons.
Identifiers: Kraft mills, Neutral sulfite semichemical pulp mills, Cross-recovery.

Great Southern Paper Co. operates an integrated unbleached kraft-neutral sulfite semichemical pulp and paper mill at Cedar Springs, Georgia. The waste treatment system includes a 300 ft diameter clarifier, 300 million gal aerated lagoon, and a 160 million gal holding pond. The latter is necessary since the mill discharges into a river regulated by a hydroelectric navigation dam. A study was made of alternative methods of increasing effluent suspended solids removal. The investigation included coagulation analyses of the effluent suspended solids, clarification of aerated stabilization basin effluent, and multi-media filtration of the effluent from the settling basin. Both sedimentation and multi-media filtration appeared capable of obtaining reductions in effluent suspended solids. It was noted that there was little or no organic removal in conjunction with the suspended solids removal. Economic analyses indicate that costs of some of the systems might make them impractical for full-scale operation. (Sykes-IPC)
W75-10400

WATER REUSE IN A PAPER REPROCESSING PLANT,
Oklahoma Univ., Norman. School of Civil Engineering and Environmental Science.
L. Streebin, G. Reid, P. Law, C. Hogan, and J. Ruppersberger.
In: TAPPI Environmental Conference, Denver, Colorado, May 14-16, 1975, Preprinted Proceedings (TAPPI, Atlanta, Georgia), p 147-159. 1 fig, 16 ref, 8 tab.

Descriptors: *Water reuse, *Pulp and paper industry, Water conservation, Water supply, *Waste water treatment, Costs, Productivity, Corrosion, Slime, *Oklahoma, Economics, Recycling, Water costs, Water demand, Water requirements, Water pollution control, Water pollution sources, Quality control, Closed conduit flow, Drainage.
Identifiers: Organic felt, Waste paper, Asphalt felt, Roofing felt.

The feasibility of water reuse was explored at Big Chief Roofing Co. (Ardmore, Oklahoma), a waste paper-reprocessing plant manufacturing organic felt (most of which is saturated with asphalt and converted to shingles and other roofing products). Before the project began, the mill was discharging 125 gal/min of water. Normal operation is now zero discharge, with approximately 12 gal/min of fresh water replacing evaporative losses. A favorable cost/benefit ratio experienced at the mill demonstrates advantages of in-plant control over end-of-pipe treatment. Economic benefits observed during zero-discharge operation include reduced water supply and waste water treatment costs, improved yield, improved drainage, and greater capacity of the dryer section due to increased operating temperatures, and resultant increased production. The benefits were partially offset by shorter felt lives, increased corrosion and slime control costs, and process modification cost. No degradation of product quality was noted. (Sykes-IPC)
W75-10401

ORGANIC COMPOUNDS IN PULP MILL LAGOON DISCHARGE,
Washington Univ., Seattle. Coll. of Forest Resources.
B. F. Hrutfiord, T. S. Friberg, D. F. Wilson, and J. R. Wilson.
In: TAPPI Environmental Conference, Denver, Colorado, May 14-16, 1975, Preprinted Proceedings (TAPPI, Atlanta, Georgia), p 181-184. 3 fig, 6 ref, 6 tab.

Descriptors: *Pulp wastes, *Organic compounds, *Aerated lagoons, *Discharge(Water), Wastes, Industrial wastes, Water pollution sources, Phenols, Acids, Liquid wastes, Aromatic compounds, Organic wastes, Waste treatment, Waste water treatment, Water pollution treatment, Water pollution control, Pulp and paper industry, *Washington, Pacific Northwest US.
Identifiers: Terpenes, Resin acids, Fatty acids, Sugar acids, Alpha-terpineol, Camphor, Kraft mills.

Organic compounds entering and leaving aerated lagoons of Weyerhaeuser Company's bleached kraft mill at Everett, Washington, have been identified and determined quantitatively. The compounds found were terpenes, resin and fatty acids, phenols, and sugar acids. The terpenes, resin and fatty acids are similar to those present in the wood species being pulped. About 8 ppm total terpenes were found in the lagoon influent and 1 ppm or less in the effluent. Alpha-terpineol was the major compound entering the lagoon, and camphor was the main terpene in the effluent. The total resin acid concentration entering the lagoon was 3.2 ppm, with 0.6 ppm leaving. Fatty acids were lower both entering and leaving the lagoon. Sugar acids were entering at about 100 ppm total, but were usually eliminated in the lagoon. Terpenes can be controlled by in-process stripping, and the other compounds can be partially controlled by in-plant spill containment. (Sykes-IPC)
W75-10402

PLANT PERFORMANCE USING DISSOLVED OXYGEN CONTROL,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
J. F. Roesler.
Journal of the Environmental Engineering Journal, Vol 100, No EE5, Proceedings of ASCE, Paper No. 10841, p 1069-1076, October 1974. 6 fig, 2 tab, 2 equ, 3 ref.

Descriptors: *Waste water treatment, *Aeration, *Automation, *Dissolved oxygen, *Water pollution control, *Environmental engineering, Frequency, Distribution, Sludge, Instrumentation, Air demand, Suspended solids, Graphical analysis, Oxygen requirements, Operations, *Performance, Control, Treatment facilities, Washington.
Identifiers: Renton(Wash).

The Renton Sewage Treatment Plant offered a unique opportunity to obtain unbiased, comparative, performance evaluation data for both automatic and manual dissolved control. The data were ranked in ascending order and plotted on logarithmic probability paper to obtain a frequency distribution. The parameters that were considered were BOD in the effluent, BOD and COD removals, sludge volume index, and settleability. All the parameters showed an improvement when the operation was changed to automatic dissolved oxygen control with the exception of COD values, which reflected little change. A rate constant that considered BOD removals, hydraulic flow, and the concentration of mixed liquor suspended solids was used to determine the overall efficiency of the process. In changing from manual to automatic dissolved oxygen control, the rate constant changed from 0.0260 - 0.1018, which reflects an improvement of 391%. This study indicates that automatic DO control can maintain excellent operational performance in a conventional activated sludge plant. The operators claim that there are less problems with filamentous bulking and that the sludge is easier to settle and handle. (Bell-Cornell)
W75-10452

WATER-QUALITY REQUIREMENTS FOR THE PETROLEUM INDUSTRY,
Neptune MicroFloc, Inc., Corvallis, Oreg.
R. H. Evers.
Journal of the American Water Works Association, Vol 67, No 2, p 60-64, February 1975. 2 fig, 10 tab, 5 ref.

Descriptors: *Water reuse, Water quality standards, Oil, Waste water, Organic compounds, Waste discharge, Industrial wastes.
Identifiers: *Petroleum industry.

A review of water reuse, water quality requirements, current effluent standards and treatment practices for water from the petroleum refinery industry is given. Water usage is divided into cooling and condensing, boiler feed, and process and other uses. Water quality guidelines have been compiled by the American Petroleum Institute. Requirements vary depending upon the future use of the recovered water, whether for potable use or washdown purposes. General guidelines indicate that water should be clear, colorless, free of iron, manganese, hydrogen sulfide, and organic growth. Tables illustrate the quality characteristics of untreated cooling waters, water use and reuse by refinery classification, raw water and reused water for steam and processing, guidelines for boiler feed water tolerances and cooling water tolerances, water quality requirements of water at point of use for the petroleum industry and treatment systems used for refinery raw waters. Effluent standards as established by the EPA are described. Future plans for waste water discharge and for reuse within the industry are being made. (Prague-FIRL)
W75-10465

MANUAL FOR PREPARATION OF ENVIRONMENTAL IMPACT STATEMENTS FOR WASTEWATER TREATMENT WORKS,

FACILITIES PLANS, AND 208 AREAWIDE WASTE TREATMENT MANAGEMENT PLANS,
Environmental Protection Agency, Washington, D.C. Office of Federal Activities.
P. L. Cook, and N. Cronin.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-235 280, $3.75 in paper copy, $2.25 in microfiche. EPA Report, August, 1973. 35 p, 3 fig.

Descriptors: *Federal jurisdiction, *Environmental effects, *Treatment facilities, Waste water treatment, Waste discharges, Publications, Pollutant effects, Planning, Publications.
Identifiers: *Environmental Impact Statements.

Detailed guidance is given for the preparation of Environmental Impact Statements (EIS) on waste water treatment works. The National Environmental Policy Act of 1969, Public Law 91-190, requires all Federal agencies to prepare environmental impact statements before acquiring Federal funds to produce a project. The requirements of the Council on Environmental Quality (CEQ) are outlined. A flowchart for the systematic gathering of information for the EIS has been drawn. Various treatment alternatives are listed, depending upon whether the facility is a treatment work, a facilities plan, or a 208 plan. Techniques such as treatment and discharge to surface waters, waste water reuse, land application, and sludge disposal alternatives are described. Alternatives are given. The review of the EIS by a Federal or State Agency representative is also discussed. (Prague-FIRL)
W75-10473

FEASIBILITY TEST PROGRAM OF APPLICATION OF COALESCING PHASE OIL/WATER SEPARATORS TO SELF COMPENSATING FUEL TANKS IN SURFACE SHIPS,
General Electric Co., Philadelphia, Pa. Re-entry and Environmental Systems Div.
For primary bibliographic entry see Field 5G.
W75-10474

PROCESS DESIGN MANUAL FOR SLUDGE TREATMENT AND DISPOSAL.
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
Report EPA 625/1-74-006, October, 1974. 389 p, 155 fig, 105 tab.

Descriptors: Publications, *Capital costs, *Operating costs, *Maintenance costs, *Sludge treatment, *Sludge disposal, *Design criteria, Pilot plants, Liquid treatment, Reviews, Systems analysis, Waste treatment, Treatment facilities.

A review is provided of current sludge processing technology as well as procedures to be considered, modified, and applied for specific design situations and unusual conditions. Regulations now require the design and construction, as well as cost-effective operation, of municipal treatment facilities to remove at least 85% of influent BOD. Discussed are the capital, operating, and maintenance costs for both primary and higher levels of treatment. Since higher treatment levels are more costly, there is an economic incentive for optimal design. Advanced waste treatment sludges and complex industrial wastes present unique problems Secondary treatment produces biological sludges in increasing amounts. Because of a lack of regulations on sludge disposal, design has focussed on liquid treatment handling. This has caused the sludge disposal methods, often disproportionate in terms of cost, to be inefficiently designed. Newer liquid treatment and sludge treatment unit processes in secondary plants are better interrelated and should be studied together. Optimum innovative design by the engineer is discussed. It is recommended that the designer: develop and maintain a thorough knowledge of various sludge treatment unit processes; continually study plant operation for feedback for future cost saving design modifications; study pilot plants of alternate prescreened systems; and use systems analysis to compare alternate complete systems. (Prague-FIRL)
W75-10475

GRAVITY DEWATERING OF METAL HYDROXIDE SLUDGES,
Permutit Research and Development Center, Princeton, N.J.
J. R. Anderson, L. B. Luttinger, and W. L. Schwoyer.
Reprint from Plating, December 1972. 5 p, 10 fig.

Descriptors: *Dewatering, *Metals, *Hydroxides, *Sludges, Catalysts, Coagulation, Precipitation, Filters, Concentrations, Flocculation, Neutralization, Flotation, Settling, Turbulence, Reynolds number, Slurries, Clarification, Laminar flow, Drag, Influent, Discharge, *Waste water treatment, *Sludge treatment.
Identifiers: Backwash.

The pH adjustment of metal finishing wastes to the range where they will be acceptable for discharge to a sewer or stream generally results in the formation of a precipitate, usually metal hydroxide. The concentration of a hydroxide, several hundred ppm, is usually too low for direct removal by most mechanical dewatering devices. The normal progression of treatment is to concentrate from the several hundred ppm range to the 0.5 to 1 per cent range by flotation or settling devices; to further dewater to the 8 to 15 per cent range by use of a liquid-solid separator; and finally secondary dewatering to the 13 to 20 per cent range by means of a press. The material at this point is a damp solid which can be hauled to a land fill or another source of ultimate disposal without drippage. The three types of devices are discussed. This system is equally applicable to crystalline solids as well as amorphous flocs. (Rowe-Vanderbilt)
W75-10500

COPING WITH URBAN RUNOFF IN THE UNITED STATES,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
R. Field.
Water Research, Vol 9, No 5/6, p 499-505, May-June 1975. 2 tab, 8 ref.

Descriptors: *Urban runoff, *Combined sewers, *Separated sewers, *Storm water, *Overflow, Waste water disposal, Filtration, Flow measurement, Infiltration, Sewage treatment, Water storage, Flow, Regulation, Disinfection.
Identifiers: Microstraining, Dissolved-air flotation, Porous pavement, Rotating biological contractor.

Combined sewers are a source of water pollution problems, but even flows of stormwater alone can seriously affect water quality. Sewer separation is very costly and solves only about 50% of the problem. Current approaches involve control of combined overflows, treatment, and combinations of the two. Control can involve maximizing of treatment with existing facilities, improvement of regulator maintenance, control of infiltration and extraneous inflows, surface sanitation, and addition of flow-increasing polymers, as well as flow regulation and storage, use of porous pavement, and vacuum and pressure-type sewer systems. A number of treatment methods are being evaluated. The most promising are microstraining at high rates, ultrahigh rate filtration on various media, screening and dissolved-air flotation, and the rotating biological contractor. Disinfection processes also can be adapted to storm flows. (Lardner-ISWS)
W75-10541

HEAT TREATMENT OF SEWAGE SLUDGES,
Millaquin Sugar Mill, Queensland (Australia).
R. B. Brooks.
Water (Journal of the Australian Water and Wastewater Association) Vol 2, No 1, p 15-18, March 1975. 6 fig, 5 tab, 5 ref.

Descriptors: *Sludge treatment, *Sewage sludge, *Heat treatment, Sewage treatment, Filtration, *Waste water treatment.

Heat conditioning of sludges, as a method of enabling more complete dewatering, has several potential advantages over chemical conditioning (including sterility of the product, and economies of using pressed sludge as fuel). However, its use has been limited; one reason for this has been a lack of understanding of the processes involved, with consequent unreliability of the operation. The results of a series of laborator experiments investigating the physical and chemical changes during heat conditioning of activated and humus sludges are presented. The process is predictable, reliable, and understandable, and thus suitable for industrial application. (CSIRO)
W75-10644

THE MUTUAL DESTRUCTION OF POLLUTING FACTORS IN WASTE LIQUORS,
Victoria State Rivers and Water Supply Commission, Melbourne (Australia).
W. M. Drew, and W. R. B. Martin.
Water (Journal of the Australian Water and Wastewater Association) Vol 2, No 1, p 9-14, March, 1975. 7 fig, 5 tab, 18 ref.

Descriptors: *Industrial wastes, *Biological treatment, *Sulfates, *Sulfur bacteria, *Waste water treatment, Microbial degradation, Anaerobic bacteria, Thermal powerplants, Pulp wastes, Dairy industry, *Australia.
Identifiers: Desulfovibrio-desulfuricans, Latrobe River(Vic).

Three major industries of the Latrobe River drainage basin (Victoria, Australia) - power generation from brown coal, pulp milling, and milk processing - each produce effluents which, in spite of existing treament facilities, are causing pollution problems, notably the production of objectionable odors from open disposal channels. Analysis of the organic and chemical composition of these wastes suggests that an appropriate mixture of the three types would provide a suitable medium for the growth of the bacterium Desulfovibric desulfuricans, which anaerobically reduces sulphates. Exploratory laboratory experiments with batch and continuous fermentation have confirmed that this process could be used in a suitably designed plant to reduce the sulfate levels, and the odor problem in consequence, and recover sulfur in saleable form. Complete treatment of the effluents to acceptable discharge standards would require the integration of this process with other treatments to remove color. (CSIRO)
W75-10645

PROGRESS IN AUSTRALIAN HYDROLOGY 1965-1974.
For primary bibliographic entry see Field 2A.
W75-10646

ENVIRONMENTAL PROBLEMS ASSOCIATED WITH THE USE OF COOLING TOWERS,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
D. L. Brenchley, and P. R. Westlin.
In: Proceedings of the 27th Industrial Waste Conference, May 2-4, 1972, Purdue University, Lafayette, Indiana, Engineering Extension Series No 141, Part 1, p 55-66. 7 tab, 29 ref.

Descriptors: *Cooling towers, *Environmental effects, *Local precipitation, *Pollution abatement, Ice, Fog, Rain, Clouds, Pollutants, Design, Sites, Air pollution effects.
Identifiers: *Cooling tower plumes.

Cooling towers will be increasingly used as a reliable method of rejecting waste heat without causing thermal pollution of rivers and lakes. The moisture from cooling towers can and has caused local fogging, icing, cloudiness, resulting in reduction of normal daily temperature variations. Also chemical additives to inhibit biological growth, corrosion, and deposition of dissolved salts within the towers may be discharged through airborne 'drift' spray. Process cooling waters often pick up impurities which are also discharged from towers. Recently developed equations for cooling tower plumes, intended as tools to assit in tower design and location, are analyzed. Abating a plume problem on an existing tower is difficult and expensive. Care must be taken in the selection, location and design of the towers to minimize atmospheric side effects and the plume problem. Some dispersion equations to assit in such decisions are now available. While the ultimate selection might be dry cooling towers, these units presently are prohibitive in construction and operating costs; only where the water supply is restricted could such a unit be justified. Within the next few years improved dry towers and combination wet-dry units will be commercially produced which will enhance the efficiency of rejecting waste heat without deleterious side-effects. (Auen-Wisconsin)
W75-10671

CONCENTRATION OF DILUTE WASTE STREAMS BY ION EXCHANGE TECHNIQUES,
Permutit Research Center, Princeton, N.J.
R. S. Hamilton.
In: Proceedings of the 27th Industrial Waste Conference, May 2-4, 1972, Purdue University, Lafayette, Indiana, Engineering Extension Series No 141, Part 1, p 80-84. 4 fig, 2 tab, 3 ref.

Descriptors: *Waste water treatment, *Ion exchange, Resins, Separation techniques, Liquid wastes.

The minimum regenerant waste volume produced by the various types of ion exchange resins is established and correlated with the respective resin exchange capacities in order to determine a 'concentration factor' for any specific influent concentration. This 'concentration factor' can then be used as a guide for deciding if ion exchange is a suitable treatment technique. The regeneration characteristics for both the weak acid cation type resin and the weak base anion type resin are very similar. The weak group resins can be regenerated with 1.1 times the stoichiometric amount of regenerant and are easily rinsed with 2 or 3 bed volumes. The ease of regeneration of the weak group resins has a significant process advantage over the strong group resins in that the regenerant quality can be very poor and yet still be efficiently used and reused. Although the concentration factor versus influent concentration for several types of resin is illustrated and provides a guide to the feasibility of ion exchange as a treatment method, engineering and design will require tests for determining capacity and regeneration efficiency to be carried out for all waste streams in order to compensate for each waste stream's individual characteristics. (Auen-Wisconsin)
W75-10672

TREATMENT OF MILK TRUCK WASHING WASTES BY ANEROBIC DIGESTION,
Rensselaer Polytechnic Inst., Troy, N.Y. Bio-Environmental Engineering Div.
D. B. Aulenbach, and R. V. Hallock.
In: Proceedings of the 27th Industrial Waste Conference, May 2-4, 1972, Purdue University, Lafayette, Indiana, Engineering Extension Series No 141, Part 1, p 126-136. 1 fig, 6 tab, 1 ref.

Descriptors: *Dairy industry, *Waste water treatment, *Aerobic treatment, Transportation, New York, *Anerobic digestion, Farm wastes.
Identifiers: *Milk truck washings.

Wastes from washing trucks delivering milk to the Hood Milk Transfer Station at Eagle Bridge, New York, contain 10% caustic, a specially formulated high phosphate detergent, a mild neutralizer, a solution containing sodium hypochlorite, and total a waste flow of approximately 5000 gpd of high alkaline discharge. Waste analysis showed an average 11.15 pH value, BOD mean value of 779, COD approximately double the BOD, and total solids of a mean value of 1768, half of which were volatile. They contain a barely adequate nitrogen supply for aerobic decomposition of the BOD while total phosphate is present in excess. A basic digestion system is illustrated and operations methodology is discussed and compared. The loadings of the two most representative systems were in the range of 0.008 lbs of BOD cu ft/day. The septic effluent from the digestor underwent a one-hour aeration, sufficient to raise the DO level and dispel odors, but does not further reduce the organics nor produce sludge. Anaerobic digestion for milk truck washings can effect a better than 85% reduction in BOD and COD at a 7-day detention time at 36C, by either single or two stage digestion. Additional nitrogen is not necessary for successful treatment. (Auen-Wisconsin)
W75-10673

SLUDGE DISPOSAL ON AGRICULTURAL SOIL,
Ohio State Univ., Columbus. Dept. of Agricultural Engineering.
R. K. White, and M. Y. Hamdy.
In: Proceedings of the 27th Industrial Waste Conference, May 2-4, 1972, Purdue University, Lafayette, Indiana, Engineering Extension Series No 141, Part 1, p 191-201. 3 fig, 1 tab, 9 ref.

Descriptors: *Waste disposal, *Sludge disposal, Agriculture, *Soil disposal fields, Application equipment, Technology, Transportation, *Waste treatment, Application methods, Costs, Facilities, Mathematical models.

Alternative equipment and processes in a system for the treatment, transportation, and disposal of sludge on agricultural soil is delineated. Selection factors, such as concentration of nitrogen or toxic elements in the sludge, are considered as constraints on a 'typical' sludge disposal system. Other cost and system constraints are considered relative to annual sludge production, seasonal distribution, sludge characteristics, geography and climate, and government regulations. A typical sludge disposal system is diagrammed, different treatment processes (depending on the disposal method) are discussed, and the selection of the proper transportation mode weighed. A mathematical model is proposed for a disposal system which puts the various concepts and constraints in a qualitative form that lends itself to optimization techniques. If the cost and constraint coefficients are constant over a sufficiently long period of time, linear programming techniques could be utilized; if one or most cost coefficients of a given process change with the amount of sludge processed, or if the constraints on a given process change with the amount of sludge processed, the resolution required nonlinear programming techniques; if the cost function or constraints change with time, the solution of the mathematical model would require dynamic programming techniques. (Auen-Wisconsin)
W75-10674

HEAVY METALS REMOVAL FROM WOOD PRESERVING WASTEWATER,
Russell and Axon, Inc., Daytona Beach, Fla.
E. H. Teer, and L. V. Russell.
In: Proceedings of the 27th Industrial Waste Conference, May 2-4, 1972, Purdue University, Lafayette, Indiana, Engineering Extension Series No 141, Part 1, p 281-286. 2 fig, 7 tab, 7 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Heavy metals, *Wood preservatives(Pesticides), Chromium, Copper, Arsenicals(Pesticides), Fluorides, Aquous solutions, Phenols, Ammonia, *Georgia.

In 1971, the Dixie Wood Preserving Company at Thomson, Georgia installed the first of its kind wastewater treatment system in the wood preserving industry, subsequently approved by the Georgia Water Quality Control Board. The design objective was to treat the concentrated waste excess from two 5000 gallon tanks so that further degradation of the Dixie Pond would cease; and when the treater is not needed for the more concentrated wastes, treat the pond water itself to lower the level to eliminate discharge and to remove toxic materials from the pond in order to enhance its biological viability. While the treater must remove chromium, copper, arsenic, fluorides, phenols, and ammonia from the wastewater, the effluent also contains some residual oxygen demand from the wood steaming and a vegetable dye used to mark the wood. Although these are negligible relative to the quantities of toxic materials, it is planned to eventually use the pond as a final polishing pond for the treater effluent. This will provide oxygenation and protection for downstream users from eutrophication induced by traces of ammonia-nitrogen and phosphate. The treatment system is described. The total investment cost was $50,000; the treater itself, labor and materials, cost below $30,000. (Auen-Wisconsin)
W75-10675

RECLAMATION OF TEXTILE PRINTING WASTEWATERS FOR DIRECT RECYCLE,
Clemson Univ., S.C. Dept. of Environmental Systems Engineering.
W. M. Kachel, and T. M. Keinath.
In: Proceedings of the 27th Industrial Waste Conference, May 2-4, 1972, Purdue University, Lafayette, Indiana, Engineering Extension Series No 141, Part 1, p 406-419. 10 fig, 4 tab, 8 ref.

Descriptors: *Industrial wastes, *Waste water treatment, *Water reuse, *Pigments, *Separation techniques, Dyes, Flocculation, Design flow, Cost comparison, Chemical precipitation, *Recycling.
Identifiers: *Textile printing effluents.

Technical and economic feasibility studies are described for textile printing wastewater pigment destabilization through pH control (which proved inapplicable) and destabilization with metallic salts. A schematic flow diagram of a proposed printing wastewater renovation and reclamation system is detailed, which provides for the addition of a metallic coagulant and caustic to the printing wastewaters for destabilization, for the mixing and flocculation of the destabilized suspension for particle aggregation, for flotation for solids/liquid separation, for recycling of the renovated water to the printing machines, for addition of make-up water, and for solids disposal by incineration. Provision is also made in the diagram for blowdown of dissolved solids and varsol, if required. Clarification efficiencies in excess of 98% were attained when either ferric chloride, ferric sulfate, or aluminum sulfate was employed as the coagulant, supplemented by pH control. Projected costs for three system alternatives, indicate that the alternative which centers on the water reuse concept has distinct economic advantages over those in which treated wastewaters are discharged to a receiving stream. Process costs for reclamation and reuse of these waters for printing equipment rinsing operations were estimated at 2.32 cents/1000 gal. (Auen-Wisconsin)
W75-10676

LAGOONS PLUS SPRAY IRRIGATION FOR EFFECTIVE BEAN CANNERY WASTE TREATMENT,
Syracuse Univ., N.Y. Dept. of Civil Engineering.
N. L. Nemerow, and J. D. Scott.

In: Proceedings of the 27th Industrial Waste Conference, May 2-4, 1972, Purdue University, Lafayette, Indiana, Engineering Extension Series No 141, Part 1, p 555-562. 5 fig, 5 tab, 3 ref.

Descriptors: *Waste treatment, *Waste water treatment, *Food processing industry, Beans, Canneries, Sprinkler irrigation, Sewage lagoons, Organic wastes, Odors, Oxidation lagoons, New York, Industrial wastes.
Identifiers: Bean cannery wastes, Eden(NY).

The design of a three-stage lagoon system for treating bean cannery effluents was based on the following criteria: (1) The organic wastes were readily oxidizable, (2) adequate land was available, (3) no municipal treatment facilities were accessible, (4) best usage of the receiving stream was for irrigation water, and (5) a short, 10-week, packing season. The ponds were built at varying depths and over a four year period effected removals of 68-85% BOD and 60-85% suspended solids, which was ample to prevent odors. Raw waste BOD, COD, and SS were about 450, 1000, and 300 mg/l, respectively, and were reduced by the ponds to values of approximately 110, 127, and 70 mg/l. The daily hydraulic raw waste loading amounted to 216,000 g/day. The total waste load was 810 lbs of BOD per day of the three pond system with the unit loading on the entire system of 260 lbs of BOD per acre/day. The pond system-treated effluent was successfuly spray irrigated on a rye grass field of loadings of 72,000 gallons per acre/day over a 3 acre field at a BOD load of 67 lbs/acre/day. The operational problems and corrective measures taken are described. (Auen-Wisconsin)
W75-10678

DISPOSAL OF LIQUID EFFLUENT BY LAND IRRIGATION AT LAGRO CELOTEX PLANT,
Celotex Corp., Lagro, Ind.
C. D. Synder.
In: Proceedings of the 27th Industrial Waste Conference, May 2-4, 1972, Purdue University, Lafayette, Indiana, Engineering Extension Series No 141, Part 1, p 563-568.

Descriptors: *Waste water treatment, Irrigation, *Industrial wastes, *Irrigation systems, *Indiana, Sprinkler irrigation, Costs, Irrigation design, Drainage, Organic wastes, *Waste disposal.
Identifiers: *Land irrigation, Lagro(Ind).

The Celotex plant at Lagro, Indiana disposes their effluent by land spraying. The effluent contains residues of organic matter from the production of building materials products. The major raw materials used are steel mill slag, foundry coke, gravel, clay, and starch. The process effluent is collected by the usual system of floor drains and underground pipes converging to one stream which is directed to a transfer pump. The spray irrigation system is installed on a 12-acre, gently sloping field. The complete disposal system consists of two pipe networks, one of which distributes the effluent to a series of sprinkler heads, while the other pipe network underlays the entire irrigation field to remove the underground drainage. The underdrain discharge joins an open ditch with the resulting flow following both open and closed ditches to the Wabash River. The design, operation, maintenance, and costs are detailed. Tests indicated that the quality of the effluent from this disposal system compares favorably, or is superior to, the river water supply. Two other spray irrigation systems installed by this corporation, one in Michigan, purified the waste effluent 99% and the Pittston, Pennsylvania plant, has used this disposal system for 10 years with satisfactory results. (Auen-Wisconsin)
W75-10679

TOXICITY OF CHLORINATED MUNICIPAL WASTES TO FISH: AN EVALUATION BASED ON MICHIGAN FIELD DATA,
Michigan Dept. of Natural Resources, Lansing. Bureau of Water Management.
For primary bibliographic entry see Field 5C.
W75-10680

VACUUM FILTRATION COST OPTIMIZATION,
Colorado Univ., Boulder. Dept. of Civil and Environmental Engineering.
E. R. Bennett, K. D. Linstedt, and D. A. Rein.
In: Proceedings of the 27th Industrial Waste Conference, May 2-4, 1972, Purdue University, Lafayette, Indiana, Engineering Extension Series No 141, Part 2, p 649-664.

Descriptors: *Optimization, *Sludge treatment, *Sewage treatment, Vacuum drying, Sludge disposal, Capital costs, Operating costs, Dewatering, Costs, *Filtration, *Waste water treatment.
Identifiers: *Vacuum filtration.

In a typical large-scale operation the solids processing system is often comprised of vacuum filtration facilities for sludge dewatering with associated incineration or landfilling capability for disposal of the dewatered sludge. The optimum operating conditions of a vacuum filter are dictated by the total sludge processing and disposal systems. The relationship between machine variables and input and output parameters are shown. The solids processing costs are very sensitive to adequancy of design and optimization of operation. This sensitivity develops in several areas of the sludge processing system through: the use of relatively large chemical doses for sludge conditioning; the effect of dewatered sludge characteristics on the capacity and auxiliary fuel requirements for incineration; and, moisture consideration in defining the conveyance capacity and costs for land disposal. This study investigated the relationship of the dose, yeild, and cake moisture variables in a vacuum filter operation, with emphasis on the means of improving cake dryness. Filtration costs and disposal costs are analyzed in detail. The vacuum filter operation is fairly insensitive to most of the machine parameters. The major factors influencing the cost of the process are the amount of activated sludge in the sludge mixture and the solids content of the feed sludge. (Auen-Wisconsin)
W75-10681

DISPOSAL OF DIGESTED SEWAGE SLUDGE BY LANDFILL,
Washington Univ., Seattle. Dept. of Civil Engineering.
B. W. Mar, and C. Henry.
In: Proceedings of the 27th Industrial Waste Conference, May 2-4, 1972, Purdue University, Lafayette, Indiana, Engineering Extension Series No 141, Part 2, p 673-678. 9 ref. EPA WPRD-180-01(R).

Descriptors: *Waste disposal, *Landfills, *Sludge disposal, *Washington, Land development, Economic feasibility, Intertidal areas, Seashores, Feasibility studies, *Waste treatment.
Identifiers: Puget Sound(Wash), Seattle(Wash), Demonstration project.

The purpose of this demonstration project was to develop a process that would employ wet digested sewage sludge to reclaim seashore land, particularly attrative since the treatment plant is located on the shores of Puget Sound and Seattle had expressed an interest in developing a parkway along that intertidal zone. The research goal was to investigate the economic feasibility and environmental acceptability of this concept. Laboratory feasibility studies investigated the dewatering and settling capabilities of the sludge. Bench scale studies investigated the problems and characteristics of centrifuging digested sludge and explored the natural drying of sand/sludge mixtures, consolidation of the mixtures, pollutional aspects of the fill, and the operation of the dewatering facility. Centrate treatment either by addition of chemicals to increase solids recovery in the cake or by direct treatment of centrage will double dewatering costs, yet the effectiveness of the chemicals is not readily predictable. A stable fill can be developed using 50% water content sludge cake. Leachate impacts of the fill can be minimized by dewatering the sludge to at least 50% solids. Public health and safety hazards were unresolved. It is recommended that the fill should be monitored for five years before this process is evaluated. (Auen-Wisconsin)
W75-10682

TREATABILITY OF LEACHATE FROM SANITARY LANDFILLS,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
W. C. Boyle, and R. K. Ham.
In: Proceedings of the 27th Industrial Waste Conference, May 2-4, 1972, Purdue University, Lafayette, Indiana, Engineering Extension Series No 141, Part 2, p 687-704. 5 fig, 17 tab, 3 ref. EPA 5-R01-EC-0041.

Descriptors: *Leachate, *Landfills, *Treatment, Sanitary engineering, Biological treatment, Aerobic treatment, Activated sludge, Chemical precipitation, *Wisconsin, Anaerobic digestion, *Waste water treatment.
Identifiers: *Leachate treatment, Madison(Wis), Milwaukee(Wis).

The characteristics and the quantity of leachate generated from a sanitary landfill site are highly variable. The described laboratory studies were designed to evaluate the ability of anaerobic and aerobic biological leachate treatment by aerobic treatment of selected combinations of leachate and domestic wastewater in a simulated activated sludge sewage treatment plant; anaerobic followed by aerobic polishing; and chemical precipitation, oxidation, and coagulation. Anaerobic treatment of raw leachate provided greater than 90% BOD reduction for detention times greater than 10 days at 23-30C. Aerobic treatment also resulted in BOD removals in excess of 90% at approximately 23C and at loadings of less than 0.03 lb BOD5/cu ft/day. Foaming and poor solids-liquids separation did occur, however. Leachate could be added to domestic wastewater in an extended aeration activated sludge plant at a level of at least 5% by volume without seriously impairing effluent quality. Lime, sodium sulfide, chlorine, potassium permanganate, alum, and ferric chloride were tested. Chemicals alone will not provide efficient removal of organics, however, good removals of multivalent cations and color may be expected with lime, the oxidants, and coagulants. Chemical treatment requires high dosage and generally produces large amounts of sludge but seems to be particularly useful in treating biological process effluent. (Auen-Wisconsin)
W75-10683

AN EFFLUENT STUDY OF A FRESH WATER FISH PROCESSING PLANT,
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
M. J. Riddle, and L. L. Murphy.
In: Proceedings of the 27th Industrial Waste Conference, May 2-4, 1972, Purdue University, Lafayette, Indiana, Engineering Extension Series No 141, Part 2, p 777-791. 9 fig, 8 tab, 3 ref.

Descriptors: *Food processing industry, *Freshwater fish, *Waste water treatment, *Biological treatment, *Canada, Perches, Smelts, Industrial wastes.
Identifiers: Stickliquor.

A statistical analysis to determine if differences existed between perch and smelt wastewater of a

freshwater fish processing plant indicated that no significant difference could be established for BOD5, COD, filtered TOC, SS or TS. Similarly the nutrient values appeared comparable. The combined wastewater have higher mean values than the separate wastewaters of the perch or smelt. The mean BOD5:N:P ratio of the combined waste was approximately 150:7:1. The discharge of the high strength stickliquor to a biological treatment system is not recommended; stickliquor should be recovered by evaporation or trucked away. The pollution of the wastewater increased with increased contact time between the solid waste material and the liquid thus dry capture techniques for transporting the fish and offal should be considered. Batch studies showed that within 10 days 90% of the total BOD5 and approximately 70% of the soluble organic carbon had been removed. The addition of 5% by volume of stickliquor to the batch biological systems decreased the reaction rates for both BOD5 and total SOC. Maximum treatment of the combined wastewater could be obtained in a reactor with a detention time in excess of 5 days with no sludge recycle or a 7.5 hr detention time with sludge recycle. (Auen-Wisconsin)
W75-10684

TREATMENT OF WINERY WASTES BY AERATED LAGOON, ACTIVATED SLUDGE, AND ROTATING BIOLOGICAL CONTRACTOR,
Lozier Engineers, Inc., Rochester, N.Y.
S. A. Labella, I. H. Thaker, and J. E. Tehan.
In: Proceedings of the 27th Industrial Waste Conference, May 2-4, 1972, Purdue University, Lafayette, Indiana, Engineering Extension Series No 141, Part 2, p 803-816. 8 fig, 6 tab, 20 ref.

Descriptors: *Waste water treatment, *Industrial wastes, Organic matter, *Biological treatment, Feasibility studies, Aerobic treatment, *Activated sludge, Design, *New York, Costs, Operating costs, *Aerated lagoons.
Identifiers: *Winery wastes, *Rotating biological contactor, Hammondsport(NY).

The aerated lagoon, activated sludge, and Rotating Biological Contactor (RBC) were evaluated to develop a treatment process for winery wastes. Based on this investigation the RBC process was selected for construction by the Gold Seal Vineyards, Hammondsport, New York to treat the 0.4 MGD flow. A summary of the treatment system is presented and the design for the treatment facility is illustrated. The RBC process operated under hydraulic loadings from 0.6 gal/sq ft/day to 1.86 gal/sq ft/day, obtained 96 to 83.3% BOD removal and 94.5 to 81.5% COD removal. The RBC successfully obtained reductions in successive stages in series at a hydraulic loading rate of 1 gal/sq ft/day. The activated sludge process and aerated lagoon would have obtained similar removals if the required nutrient balance was maintained in the waste feed. The sludge produced by RBC settled easily and displayed the fastest settling rate. Capital costs of the activated sludge process and RBC were found to be approximately equal, but the yearly operating cost of RBC was $6,000/yr less. The RBC process design was selected on the basis of technical advantages, simplicity of operation and economic efficiency. (Auen-Wisconsin)
W75-10685

WILL WASTEWATER TREATMENT STOP EUTROPHICATION OF IMPOUNDMENTS,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
T. J. Grizzard, and E. M. Jennelle.
In: Proceedings of the 27th Industrial Waste Conference, May 2-4, 1972, Purdue University, Lafayette, Indiana, Engineering Extension Series No 141, Part 2, p 851-866. 9 tab, 34 ref. NSF GK-5634.

Descriptors: *Eutrophication, *Pollution abatement, *Waste water treatment, *Waste water(Pollution), Municipal wastes, Nutrients, Water pollution sourses, Runoff, Sewage effluents, Reservoirs, Tributaries, *Virginia, Phosphorus, Nitrogen, Carbon, Drainage basins, Impoundments, Water pollution effects.
Identifiers: *Nutrient sources, Roanoke River(Va), Smith Mountain Lake(Va), Roanoke(Va).

Wastewater discharges from Roanoke, Virginia and environs account for 64% of the total phosphorus, 72% of the total nitrogen, and 54% of the organic carbon entering Smith Mountain Lake. Macronutrient yields from land drainage alone were found to be adequate to maintain eutrophication in this impoundment. A reduction in the nutrient yield from wastewater discharges will materially reduce the nutrient inflow to the lake, but this will not significantly improve water quality, as shown in the comparison of limiting concentrations if tertiary treatment of all wastewater is required. Becasue of the morphology and relative low inflow to volume relationship for this lake the movement of nutrients is slow, resulting in a high nutrient retention in the upper reaches. The continual increase in both population and industrial activity will also significantly increase the yield of metal cations and other nutrients. Calculations of nutrient yields by watershed type, by the drainage area of Roanoke River and tributaries, the wastewater loading to the basin, land runoff, and comparison of concentrations entering the impoundment to accepted limiting concentrations indicate that a program of total environmental management is needed if the recreational potential of downstream impoundments is to be preserved. (Auen-Wisconsin)
W75-10686

ANALYSIS OF WASTEWATER TREATMENT SYSTEMS FOR A MEAT PROCESSING PLANT,
Iowa Univ., Iowa City. Dept. of Civil (Environmental) Engineering.
W. L. Paulson, L. D. Lively, and J. L. Witherow.
In: Proceedings of the 27th Industrial Waste Conference, May 2-4, 1972, Purdue University, Lafayette, Indiana, Engineering Extension Series No 141, Part 2, p 879-893. 3 fig, 9 tab, 5 ref.

Descriptors: *Waste water treatment, *Food processing industry, *Design, Treatment facilities, Feeds, Recycling, Activated sludge, Sludge treatment, Industrial wastes.
Identifiers: *Meat processing wastes, Animal feed supplement.

The results of a demonstration project, to determine the effectiveness of the oxidation ditch activated sludge (Pasveer) process are described. The project was located at the John Morrell and Company meat processing plant, Ottumwa, Iowa, where from 3.25 to 3.5 MGD wastewater would require treatment. The daily (5-day week) BOD loading was predicted to be 38,000 lbs. Based on the flow rate, effluent quality (BOD5) would have to be between 75 and 80 mg/l. The overall treatment plant efficiency (BOD) required would be approximately 95%. A schematic flow diagram of the plant design, a plant drawing listing the units, and plant features are given. The evaluation of the feasibility of using waste activated sludge as an animal feed supplement showed potential. The design and operation of the primary treatment units proved inadequate. More efficient grease and SS removal were needed prior to the aeration process. The tubular conveyors used were unsatisfactory as sludge removal mechanisms. The process is capable of achieving organic removals of 90-95% from meatpacking wastewater; however, effluent ammonia levels are of concern. Improvements in pretreatment, aeration system capacity, and final sedimentation were needed. Mechanical equipment should be properly located and protected to minimize icing. (Auen-Wisconsin)
W75-10687

POPULATION DYNAMICS OF PROTOZOA IN WASTEWATER, AND IMPACT OF ENVIRONMENTAL CHANGES,
Howard Univ., Washington, D.C. Bio-Environmental Engineering and Sciences Research Lab.
M. M. Varma, H. E. Finley, and G. H. Bennett.
In: Proceedings of the 27th Industrial Waste Conference, May 2-4, 1972, Purdue University, Lafayette, Indiana, Engineering Extension Series No 141, Part 2, p 994-1003. 7 fig, 2 tab, 24 ref. EPA 5P1-WP-178-02.

Descriptors: *Aquatic animals, *Protozoa, *Waste water treatment, *Sewage treatment, Animal behavior, *Environmental effects, Activated sludge, *District of Columbia, Systematics, Sewage bacteria.
Identifiers: Vorticella, Opercularia, Colpoda, Calpidium.

The relative importance of bacteria and protozoa in wastewater/sewage treatment was investigated by identifying the dominant protozoa in the various segments of the treatment process at the Water Pollution Control Plant of the District of Columbia; then the behavior of these protozoa in the secondary effluent, under uncontrolled environmental variables, with particular attention to the relation of pH was observed; followed by the behavior of the protozoa under some controlled variables. Vorticella and Opercularia were conspicuously successful in secondary effluent because of the presence of a large number of bacteria and high dissolved oxygen. Probably not only the number of bacteria present, but possibly also the kinds of bacteria present exert some influence as to which protozoa are dominant. While more research is recommended to determine the actual purification mechanism, i.e., is it catalase activity, protozoan activity, or a combination of both, and which is more important, these research results indicated that Vorticella, responsible for clarification, was dominant in secondary effluent; the death rate of Opercularia was not significantly affected by changes in pH (6.8-8.3); Vorticella was more sensitive within the same pH range; and that Opercularia population increased in number when glutamic acid was added to the medium. (Auen-Wisconsin)
W75-10689

WATER POLLUTION PROBLEMS ASSOCIATED WITH CONTROL OF STACK GAS EMISSION,
National Lime Association, Washington, D.C.
For primary bibliographic entry see Field 5B.
W75-10691

TREATMENT PROCESSES FOR COPING WITH VARIATION IN RAW-WATER QUALITY,
National Environmental Research Center, Cincinnati, Ohio. Water Supply Research Lab.
For primary bibliographic entry see Field 5F.
W75-10705

DOMESTIC WASTE WATER REUSE--ASPECTS OF THE TREATMENT SYSTEM,
Netherlands Waterworks, Rijswijk. Testing and Research Inst.
D. Kuiper, and R. Wechsler.
Water Research, Vol 9, No 7, p 655-657, July, 1975. 1 tab, 1 ref.

Descriptors: *Water reuse, *Water supply development, *Waste water treatment, *Water purification, Reclamation, Water treatment, Activated carbon, Water quality control, Reverse osmosis, *Sewage treatment, Water analysis, Potable water, *Domestic wastes, Domestic water.

The general requirements of a waste water reuse system--that it produce water meeting the highest existing drinking water standards, that it remove any conceivable pollutant, and that the process be

highly reliable--can be met now. Increasing deterioration of water supply sources requires advanced treatment processes while environmental legislation requires improved sewage treatment. From 50 to 80% of the water supplied returns as effluent. Relative independence from increasingly polluted sources could be gained by closing the cycle and reusing this water. The very high standards necessary to prevent contaminant build-up can be met by a treatment system consisting of several processes which rely on different and unrelated mechanisms working in series with overlapping functions. Overload capacity, quality control, and good design to prevent cross infection are essential. A proposed system works with effluent from conventional primary plus secondary biological treatment. This treated water is fed through lime clarification which disinfects at high pH and removes colloidal matter and calcium salts. Hyperfiltration (reverse osmosis) next removes substances with molecular weight over 200. Low molecular weight dissolved organics are next removed by activated carbon treatment. Finally, chlorine disinfection removes any residual ammonia and protects against quality deterioration. This combined sewage and water treatment process could be competitive with conventional water supplies. (Herr-North Carolina)
W75-10708

WATER AND WASTEWATER FACILITIES FOR FLORIDA HOUSING DEVELOPMENTS,
Singer Co., Bridgeport, Conn. Water Resources Div.
B. W. Valentine.
Public Works, Vol 104, No 10, p 98-99, Oct 1973. 1 tab.

Descriptors: *Waste water treatment, *Florida, *Water purification, *Water supply development, *Sewage treatment, Water quality control, Aquifers, Chlorination, Waste disposal wells, Water wells, Aeration, Sludge treatment, *Treatment facilities.
Identifiers: Delray Beach(FL), West Palm Beach County(FL).

Near Delray Beach, Florida, 3,400 residents in 3 new developments are being served by a combined water supply and wastewater treatment facility. Phase I of the project, now complete at a cost of $800,000, includes 2 water supply wells, a 1 MG reservoir for treated water, treatment facilities, and a control building. Water supply is from 2 12-inch diameter wells 150 ft deep delivering over 1 mgd. Water of the best available quality is from this depth, although treatment for hardness, filtering, and chlorination are required before it meets potable standards. Treated water is distributed over the 3,000 developed acres through 105,000 ft of main. Gravity and force mains collect wastewater which is treated in the 1 mgd plant and piped to 3 evaporation-percolation ponds. Expansion plans call for injection of treated effluent into the 'Bolder Zone Aquifer' which is already contaminated by water of high salinity, or discharge into the Atlantic Ocean. Phases II and III will more than quadruple the capacities of the Phase I construction. The control building houses water treatment equipment and controls, a laboratory, and a loading dock to serve both plants. An isolated portion of the building houses chlorination equipment to serve both. West Palm Beach County has agreed to assume ownership and operation of the facility upon completion. (Herr-North Carolina)
W75-10717

STOCKHOLM PUTS SEWAGE PLANTS UNDERGROUND,
Stockholm Municipal Services Dept. (Sweden). Div. of Treatment Plant Design.
S. Edlund, and G. E. Sandstrom.
Civil Engineering - ASCE, Vol 43, No 9, p 78-83, Sept 1973. 5 fig.

Descriptors: *Underground structures, *Waste water treatment, *Tunnel construction, Environmental sanitation, Tunnels, *Sewage treatment, Tunnel linings, Municipal wastes, Tunnel design, Engineering geology, *Treatment facilities.
Identifiers: *Sweden.

To conserve surface land and eliminate sewage odors, 3 of the 4 treatment plants in Stockholm have been built underground. The Henriksdal plant, the city's largest with a 97.8 mgd capacity, is potentially less expensive than a conventional plant would be if surrounded by a 500 m (1640 ft) buffer of expensive land to protect neighbors from the odor. Construction costs of $306/1000 gallons of plant capacity are from 1.35 to 1.45 times the cost of a similar activated sludge plant built on the surface. (Cost comparison with U.S. facilities is difficult since higher U.S. labor prices would raise costs for both surface and underground facilities.) The heating plant, digestor, and buildings for personnel and workshops are built on the surface. Below at least 10 m (33 ft) of rock cover are settling and aeration tanks which are actually chambers roughly 10 m by 10 m and up to 135 m (545 ft) long. The tanks are lined with poured-in-place concrete bolted to the rock walls and punctured to allow groundwater seepage into the tanks. Groundwater pressure prevents sewage seepage out of the tanks and tunnels. The ventilation system, using a series of tunnels and fans to exchange the underground air three times per hour, exhausts up a smoke stack along with sludge odors and diesel fumes. Air pressure is kept low in foul smelling areas of the plant to prevent odors from spreading. (Herr-North Carolina)
W75-10718

LAND TREATMENT OF MUNICIPAL SEWAGE,
K. A. Godfrey, Jr.
Civil Engineering-ASCE, Vol 10, No 9, p 103-109, Sept, 1973. 1 fig, 6 tab.

Descriptors: *Water reuse, *Waste water treatment, *Soil disposal fields, *Application methods, *Soil treatment, Treatment facilities, Oxidation, Sludge treatment, Tertiary treatment, Waste assimilative capacity, Municipal wastes, Soil chemical properties, Sanitary engineering, Michigan, Arizona.
Identifiers: *Muskegon(MI), Flushing Meadows(AZ).

Land treatment of municipal sewage, after secondary treatment and chlorination, is a viable method of tertiary treatment when designed with necessary safeguards. Used in the arid southwest to augment water supply, land treatment may be used increasingly throughout the country. Treated feedwater is applied in three ways. Spray irrigation on crops, grassland, or woodlands on nearly level land may need underdrains to avoid waterlogging and/or salt buildup. Municipal sewage is treated at Muskegon, Michigan, in this way at the first major U.S. regional and complete land treatment system. On gentle slopes where clay soils prohibit percolation, a 'spray runoff' overland flow technique has effectively treated food processing plant waste. Both methods require extensive land area and thus large initial capital costs, but such land might serve multiple purposes including recreation, open space, agricultural production, power plant site. Income from other uses could offset operating costs, normally lower because large chemical dosages are not required. Infiltration, the third method, uses land far more intensively, requiring only 2 to 10% of the land the others need. Treated effluent is percolated in large amounts (up to 400 ft per year) through permeable soils to recharge groundwater. Nitrate, heavy metals, and viruses need further study, but present knowledge can design successful systems. (Herr-North Carolina)
W75-10719

WATER SUPPLY FROM RENOVATED WASTEWATER--A RESOURCE MANUAL FOR MASSACHUSETTS PLANNERS, PUBLIC OFFICIALS AND CITIZEN GROUPS.
Clark Univ., Worcester, Mass.
1972. 207 p, 43 fig, 16 tab, 142 ref. Kasperson, R E, and Eichen, M., eds.

Descriptors: *Water reuse, *Reclaimed water, *Water supply development, *Water treatment, *Dependable supply, Public health, Water pollution, Water costs, Consumptive use, Environmental engineering, Water resources, Impaired water use, Irrigation water, Alternative costs, *Massachusetts.
Identifiers: *Dual water supply systems, Metropolitan District Commission(Boston MA).

Metropolitan Boston, although situated in the humid northeast, is faced with the prospect of water shortages due to growing population and per capita use. This study examines one source of supply--reclaimed water--in general terms and as it might be applied to Boston. Treatment techniques are analyzed for their abilities to deal with heavy metals and toxic organic materials, and for their costs. Complete purification of waste water for all uses is expensive, lacks public support, and may pose long-term health hazards even when it meets current standards. Instead of treating waste water to make it potable, a heirarchy of water used is proposed. Higher order uses, including drinking, cooking, and bathing, require much more stringent standards than lower order uses such as irrigation or industrial application. Eighteen locations currently using renovated wastewater in municipal, industrial, recreation, or irrigation uses are listed, and two in California, Santee and Lake Tahoe, are described, as well as the Windhoek, South Africa, reclamation plant which supplies 1/3 of the city's water. The Metropolitan District Commission's Quabbin Reservoir in cental Massachusetts is being depleted by 12 million gallons per day. Immediate and long range plans are discussed, and a dual water supply system using reclaimed waste water for major lower order uses is proposed. (Herr-North Carolina)
W75-10722

LIQUEFYING REFRIGERANT FOR WATER DESALINATION WITH LIQUEFIED NATURAL GAS AND AN INTERMEDIATE ENERGY CYCLE,
Nuovo Pignone S.p.A., San Donato Milanese (Italy). (assignee)
For primary bibliographic entry see Field 3A.
W75-10725

INTEGRAL CIRCULAR WASTEWATER TREATMENT PLANT,
Union Carbide Corp., New York. (assignee)
L. M. LaClair, J. R. McWhirter, and W. L. Ross.
US Patent No 3,890,231, 12 p, 17 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 935, No 3, p 1206, June 17, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution control, Water quality control, Aeration, Equipment, *Treatment facilities.
Identifiers: Clarification.

A method of and apparatus for treating wastewater by aeration with at least 50 percent oxygen in an integral circular plant is disclosed. The wastewater treatment apparatus comprises a circular tank outer wall, a circular inner wall concentric with and spaced from the outer wall forming an inner volume and an intermediate volume between the inner and outer walls such that the ratio of the inner wall radius to the outer wall radius is between 0.25 and 0.70. A first radial partition extends across the intermediate volume between and joined at opposite edges to the inner and outer walls, and a second radial parition also extends across the intermediate volume between

and joined at opposite edges to the inner and outer walls. First fluid mixing and recirculation are provided within the outer wall in a first part to form a first aeration zone. Second fluid mixing and recirculation means are provided within the outer wall in a second part other than the first arcuate portion to form a second aeration zone. Gas and liquor passages are provided between and means for uniformly distributing oxygenated liquor around the clarifier inner wall for radial flow toward the outer wall are also provided. (Sinha-OEIS)
W75-10729

METHOD OF TREATING ALUMINUM-CONTAINING WASTE WATER,
Kurita Water Industries Ltd., Osaka (Japan). (assignee)
Y. Hanami, and Y. Fukuyama.
US Patent No 3,890,226, 5 p, 4 ref; Official Gazette of the United States Patent Office, Vol 935, No 3, p 1205, June 17, 1975.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water pollution control, Aluminum, Precipitation, Neutralization, Acids.
Identifiers: Acid wastes, Alkali wastes, Aluminum manufacturing.

Waste waters from the aluminum surface treating process of aluminum manufacturing factories are subjected to a neutralization treatment in order to obtain dischargeable treated waters and also to recover aluminum hydroxide sludge having a moisture content of less than 60 percent, especially less than 50 percent. Aluminum sludge is recovered from alkali and acid waste waters which are high in aluminum concentration as well as from the general waste water (rinsing waste water) which is low in aluminum concentration. The method treats aluminum-containing waste waters by adding acid waste water to the aluminum-containing alkali waste water to neutralize those waste waters. The neutralization reaction is characterized by adding the acid water slowly after the aluminum hydroxide begins to precipitate, and prolonging the netralization time. (Sinha-OEIS)
W75-10730

PROCESS FOR REMOVING HEAVY METAL IONS IN WATER,
Y. Kajiyama.
U.S. Patent No. 3,890,225, 5 p, 4 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 935, No 3, p 1205, June 17, 1975.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Heavy metals, *Water pollution treatment, Adsorption, Filtration, Limestones, Soil contamination.
Identifiers: Coral fossil limestones.

A process is described for preventing water and soil pollution. Coral fossil lime stone is used in the filtering apparatus. The coral fossil consists mainly of limestone, abundantly occurring in layers on the coral reefs of the South Sea Islands, the Okinawa Islands and the Tokunoshima Island, and is ground into grains of sand-like or pebble-like size. This coral fossil is mineralogically composed of calcite containing a certain amount of aragonite and has a different mineral composition from that of the lime stone of compact structure, occurring in Japan proper. The coral fossil is formed of the remains of coral, Foraminifera, lime algae, Mollusca, etc. of the Quaternary period of geologic time, and is extremely porous. Industrial water, sewage, sludge deposits or soil polluted with heavy metals is poured into the filtering apparatus directly or with water to adsorb and remove the heavy metal ions such as Cu, Cd, Hg, Pb, Zn, etc. The treating material that has adsorbed heavy metal ions may be heated to convert the metals into their oxides, or may be treated with dilute acid to liberate and recover the heavy metals. The regenerated adsorbing materials can be reused for the removal of heavy metal ions. (Sinha-OEIS)
W75-10731

AIR AND WATER POLLUTION CONTROL,
El Paso Southern Co., Tex. (assignee)
W. H. Chapman, and J. F. Eichelmann, Jr.
U.S. Patent No. 3,890,207, 6 p, 1 fig, 13 ref; Official Gazette of the United States Patent Office, Vol 935, No 3, p 1200-1201, June 17, 1975.

Descriptors: *Patents, *Gases, *Air pollution, *Industrial wastes, *Waste water treatment, *Separation techniques, *Water quality control, Water pollution treatment, Distillation, Evaporation.
Identifiers: Water scrubbers, Wet dust collectors.

A process is described for the purification of industrial effluent gases by means of water scrubbers, wet dust collectors and the like. The scrubber water, rather than being discarded and thereby creating another pollution problem, is itself purified and reused for industrial and domestic purposes. The suspended contaminants in the water effluent are separated and the resultant water effluent is freed of dissolved noxious gases and fumes and is substantially distilled to give a pure water condensate and a concentrated effluent containing dissolved solids. The concentrated water effluent is mixed with a circulating, relatively non-volatile carrier liquid, the water is evaporated and recovered as an industrial water condensate, and the precipitated solids are removed from the carrier liquid. (Sinha-OEIS)
W75-10732

ROTARY DESALINATION ENGINE AND SYSTEM,
Frontier Engineering Corp., Houston, Tex.; and Zachry (H. B.) Co., San Antonio, Tex. (assignees)
For primary bibliographic entry see Field 3A.
W75-10733

CLOSED RECYCLING SYSTEM FOR WATER PURIFICATION AND WASTE REDUCTION,
D. W. Stout.
U.S. Patent No. 3,892,662, 6 p, 3 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 936, No 1, p 225, July 1, 1975.

Descriptors: *Patents, Water purification, *Waste water treatment, Water quality control, Water pollution control, *Separation techniques, *Freezing, *Centrifugation, Incineration, Industrial wastes, Domestic wastes, Equipment, *Recycling.
Identifiers: Water crystals.

A waste purification and reduction, water purification and recycling process comprises collecting and storing household, commercial or industrial waste, homogenizing the waste and reducing the solid content to uniform fine particle size. The homogenized waste is injected through an atomizing nozzle. Then the atomized waste is cryogenically frozen into minute crystalline particles consisting essentially of water crystals and crystals of solid waste. The crystalline particles are homogenized and the size of the particles reduced to produce a crystalline particle mass having the flow characteristics of a liquid. The water crystals are centrifugally separated from the solid waste crystals and the water crystals are heated to steam and the steam is condensed into water for recycling for household use. The solid waste crystals are heated to combustion gas and ash which are then separated and the gas is vented and the ash is collected. (Sinha-OEIS)
W75-10735

REMOVAL OF POLLUTANTS FROM WATER,
Melbourne Univ., Parkville (Australia). (assignee)
N. G. Siviour, G. M. Pearson, and G. V. Cullen.
U.S. Patent No. 3,892,661, 5 p, 7 tab, 9 ref; Official Gazette of the United States Patent Office, Vol 936, No 1, p 225, July 1, 1975.

Descriptors: *Waste water treatment, *Patents, *Water pollution treatment, *Water purification, *Water quality control, Absorption, Lignite, Coals, Chemical Oxygen Demand.
Identifiers: Brown coal chars.

Described is the use of brown coal and especially brown coal chars as absorbents for pollutant materials, including microbial organisms and non-living pollutant substances. Brown coal will remove pollutant organisms from water with a high degree of efficiency; however brown coal itself is not particularly effective in the removal of other pollutant substances (as measured by C.O.D.). Brown coal chars will effect substantially reduction in the C.O.D. of polluted waters, without resorting to any special procedures for activation of the chars. Chars may be produced from brown coals by heating at any temperature between about 200 deg and 1200 deg C. (Sinha-OEIS)
W75-10736

METHOD OF PURIFICATION OF WASTE WATER PRODUCED FROM THE PACKING OF MEAT AND AQUATIC ANIMALS,
Zenkoku Reitogyoniku Kyokai, Hokkaido (Japan). (assignee)
M. Furuta.
U.S. Patent No. 3,892,640, 7 p, 4 fig, 3 tab, 9 ref; Official Gazette of the United States Patent Office, Vol 936, No 1, p 219, July 1, 1975.

Descriptors: *Patents, *Waste water treatment, *Water pollution control, *Water quality control, *Water purification, *Electrolysis, Biochemical oxygen demand, Chemical oxygen demand, Electrolytes, Separation techniques, Equipment.
Identifiers: Slaughter and processing waste water.

A method is disclosed of purifying the contaminated waste water that is produced in the slaughter and processing of livestock and aquatic animals and containing water-soluble colloidally dispersed materials selected from at least one of water soluble protein, visceral matter or blood. The method includes passing the waste water through the compartments of at least one electrolytic tank containing a number of compartments; each compartment is separated from the next adjacent compartment by an electrically insulated partitioning plate. Each compartment contains at least one pair of electrode plates comprising a solid metallic anode selected from iron, stainless steel or aluminum and a cathode. At least one electrolyte is added to the waste water, selected from the group consisting of the halides, halogen acid salts and nitrates of the alkali metals, alkaline earth metals and ammonium in an amount such that the concentration of the electrolyte in the waste water is 0.03 - 1.7% by weight. The waste water is agitated and waste matter adhering to the surfaces of the electrodes is removed after passing a direct-current through the electrolyte-added waste water to effect its electrolysis. (Sinha-OEIS)
W75-10737

MULTIPLE CYCLE PROCESS FOR WASTE-WATER PURIFICATION,
Airco, Inc., Montvale, N.J. (assignee)
B. S. Kirk.
U.S. Patent No. 3,892,659, 6 p, 3 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 936, No 1, p 224, July 1, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, Water quality control, Oxygenation, *Activated sludge, *Biological treatment, *Recycling.
Identifiers: Clarification.

An improved and economical multiple-pass wastewater treatment system using the activated sludge biological process is capable of increasing the effective reactor detention time as required for effective water purification without decreasing the

correct flow velocity required for efficient mixing of the reacting liquid. A mixing vessel or well receives influent waste-water and activated sludge. The mixture is continuously withdrawn and mixed with oxygen as it goes successively through a plurality of contained reaction stages for predetermined detention and oxygenation of the mixed liquor. After detention and before clarification, the mixed liquor is divided into two streams, one of which goes to a clarifier, the other being recycled directly to the mixing vessel. The recycled stream which is subject to control for compensating significant variations in flow rate of incoming wastewater, is at least equal to the volume of the clarifier stream and may be greater, depending on the desired number of recycling passes of the mixed liquor through the detention-reaction stages. A generally continuous turbulence of the mixed liquor is induced during the reaction-detention period for optimizing the BOD reduction. Activated sludge from the clarifier is recycled to the mixing well and the clarifier effluent after disinfection is discharged for return to natural waters. (Sinha-OEIS)
W75-10738

PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON WASTE OIL RECOVERY AND REUSE.
Association of Petroleum Re-Refiners, Washington, D.C.
Held February 12-14, 1974, Washington, D.C. Published by Information Transfer Inc., Washington, D.C., 1974. 418 p.

Descriptors: *Recycling, Oil, *Oil wastes, Oil spills, *Oil pollution, *Waste treatment, Water pollution control, *Pollution abatement, Water reuse, Separation techniques, Waste water treatment, Water pollution sources, *Industrial wastes, *Waste disposal.
Identifiers: *Waste oil recovery, *Waste oil reuse.

During the three day conference papers were presented on the technical, institutional and economical aspects of spent and waste oil recovery. The attributes of reuse of waste oil as a fuel oil as well as the institutional problems and potentials by detrimental aspects were fully considered. The latest information has been reviewed on the magnitude of the problem, the sources of the problem, technical solutions, institutional problems, examples of recycle and reuse, and national, state, and municipal programs. (See also W75-10740 thru W75-10768).
W75-10739

OIL REUSE--A NATIONAL NEED,
Environmental Quality Systems, Inc., Rockville, Md.
L. W. Weinberger.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Inc., Washington, D.C., p 5-7, 1974.

Descriptors: Oil, *Oil wastes, *Oil industry, Fuels, Water pollution sources, *Oil pollution, Waste disposal, Recycling, Industrial wastes.
Identifiers: *Waste oil recovery, *Waste oil reuse, Re-refining.

Oil waste is one of the few pollutional problems whose solution would meet the criteria of: improving environmental quality of water, air, and land; conserving energy; conserving resources; and, making economic sense. Waste oils can be re-refined. They are a resource which can be utilized to reduce energy and oil shortages. They are currently being disposed of in ways which cause environmental degradation. Certain practices related to oil disposal such as uncontrolled use as a fuel should be prohibited. Most oil re-refiners in business ten years ago have gone out of business. Both the Federal Water and Air Quality Acts put tighter controls on disposing of waste oils. An effective waste oil collection, treatment, and reuse system must include storage, collection, treatment, distribution and sale, licensing, monitoring and surveillance, financing and legislation, as well as roles for all segments of society to play in the development of such a system. The reason there is presently no viable oil reuse system is that no one seems to have the responsibility or is willing to assume the responsibility of putting the necessary programs together. The institutional aspects appear to be of more significance than the technical or economic aspects. (See also W75-10739) (Orr-FIRL)
W75-10740

THE SOURCE AND SUPPLY OF VIRGIN LUBES,
Sun Oil Co., Philadelphia, Pa.
For primary bibliographic entry see Field 5B.
W75-10741

WASTE OIL MANAGEMENT--THE ENVIRONMENTAL PROTECTION AGENCY'S ROLE,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10742

DISPOSAL OF USED CRANKCASE AND OTHER OILS IN CANADA,
Department of the Environment, Ottawa (Ontario).
D. J. Skinner, and P. L. Strigner.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-24, 1974, Washington, D.C., Information Transfer, Inc., Washington, D.C., p 29-41, 1974. 11 ref.

Descriptors: *Oil, *Oil wastes, Oil industry, Legislation, Governments, *Canada, *Waste disposal, Foreign research, Industrial wastes.
Identifiers: Re-refining.

The waste oil problem in Canada is discussed. The formation of the Petroleum Association for Conservation of the Canadian Environment (PACE) is described. More than 40,000,000 gallons of used crankcase oil are generated in Canada annually; when all waste oil is considered the amount may be as much as 70,000,000 gallons. A variety of storage/collection techniques are operative. Disposal of waste service station and other crankcase oils is varied--road oiling is most common, followed by re-refining, land fill, combustion as fuel and incineration. Undesirable features of the disposal methods are environmental pollution and irretrievable loss of resource. Investigations to improve some of the disposal methods are increasing. Legislation is aimed largely at controlling pollutional aspects. Governments and the petroleum industry are showing an increased interest in disposal because of antipollution pressures and also the energy shortage. Recommendations include: the creation of an active, voluntary, national body comprising representative personnel from the oil industry, oil disposal firms, and various levels of government; Statistics Canada and PACE should gather more detailed statistics on the availability of used oils with emphasis as to the types and source; and, extension of change periods for oils to prolong their use should be studied. (See also W75-10739) (Orr-FIRL)
W75-10743

WASTE OIL IN MARYLAND: A POLLUTANT OR A RESOURCE,
Maryland Environmental Service, Annapolis.
For primary bibliographic entry see Field 5B.
W75-10744

WASTE OIL: THE RECAPTURE OF AN ENERGY RESOURCE (THE GENERATION, DISPOSAL AND RECOVERY OF WASTE OIL IN THE NEW YORK METROPOLITAN AREA),
Council on the Environment of New York City.
S. Maltezou.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Inc., Washington, D.C., p 55-69, 1974. 5 tab.

Descriptors: *Oil, *Oil wastes, *Waste disposal, Oil industry, New York, Industrial wastes, Water pollution sources.
Identifiers: *New York(NY), Re-refining.

Although the data collection of this study was restricted to the New York Metropolitan area, the importance of this area as an industrial, commercial, urban and suburban center permits the observations and methodology at this local level to be used to assess the waste oil situation in comparable areas, both nationally and internationally. The main findings are in the following categories: quantities of waste oil generated by type and location of users of oils; methods of disposing of waste oil by users of oil, approximate quantities of waste oil disposed of, and cost of each method of disposal; systems of collection and outlets for the collected waste oil and percentages of waste oil diverted to the outlets of collection; ways of reusing waste oil, such as re-refining, dust and weed control, and percentage of oil used in each way; quantities of waste oil processed by re-refineries and reprocessors in the New York metropolitan area; quantities of fuel and lubricants used in the New York metropolitan area and the degree to which an optimal recovery system of available waste oil could supplement them; and, general trends in the disposal, recovery and reuse of waste oil. (See also W75-10739) (Orr-FIRL)
W75-10745

WASTE LUBRICATING OIL CHARACTERISTICS--DO THEY VARY GEOGRAPHICALLY, SEASONALLY, AND WITH ORIGIN,
American Petroleum Inst., New York. Task Force on Utilization of Waste Lubricating Oils.
For primary bibliographic entry see Field 5B.
W75-10746

CONTAINMENT, COLLECTION AND RECYCLING OF OILY WASTES,
For primary bibliographic entry see Field 5G.
W75-10747

ENVIRONMENTAL ACTION AT PORT AUTHORITY AIRPORTS,
Port Authority of New York and New Jersey.
For primary bibliographic entry see Field 5G.
W75-10748

DISPOSAL AND/OR RECYCLE OF AIR FORCE WASTE PETROLEUM OILS AND LUBRICANTS,
R. H. Kroop, and M. Lieberman.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Inc., Washington, D.C., p 117-129, 1974. 4 fig, 5 tab.

Descriptors: *Oil wastes, *Recycling, *Waste disposal, *Waste treatment, *Oil pollution, Pollution abatement, Aircraft, Airports, Water pollution sources.

The disposal of Air Force waste petroleums, oils, and lubricants (POL) is a complex and serious problem. Efforts to determine how waste POL products could be more effectively disposed of or recycled are discussed. Topics considered include the generation of waste POL's at Air Force installations, the collection and segregation of such wastes, disposal and recycle alternatives, and the reprocessing of synthetic turbine lubricants. None

of the several disposal and recycle alternatives available is universally applicable. A highly desirable solution at one installation may not be feasible for another installation even though both installations may generate the same types and volumes of waste POL's. Contractor pickup for ultimate disposal or recycle involves the least effort for base personnel, but provides only a low, if any, monetary return. On-base disposal by fuel downgrading on combustion in existing boilers involves extra handling but can be widely applied and contributes to solving both environmental problems and energy shortages. The reprocessing and recycle of synthetic turbine lubricants shows definite potential and must be evaluated from the viewpoints of product reliability and economics. (See also W75-10739) (Orr-FIRL)
W75-10749

THE NAVY'S OILY WASTES HANDLING AND DISPOSAL PROGRAM,
Naval Material Command, Washington, D.C.
E. T. Kinney, and M. G. Grant.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Inc., Washington, D.C., p 133-147, 1974. 3 fig, 4 tab, 11 ref.

Descriptors: *Oil wastes, *Oily water, Equipment, *Waste treatment, Oil spills, Construction, Waste disposal, Facilities, Ships, Fuels, Oil, Pollution abatement, Water pollution sources, Treatment facilities.
Identifiers: Waste oil management.

An outline is given of the Navy's oily wastes handling and disposal program. The program has two main goals: to prevent the generation of these wastes; and, to use a total system approach at naval complexes to provide maximum utilization of existing, modified, and new disposal/reclamation facilities. In the fiscal year 1973, the Navy used more than 90 million barrels of fuel oil and related petroleum products. Due to the nature of the total oil management system and utilization requirements within the Navy, a variety of oil wastes are produced, both ashore and afloat. The measures being taken to prevent oil spills and to reduce the volumes of oily wastes to be disposed of will have a significant effect on the requirements for waste oil treatment and disposal facilities. The facilities will require a total system concept including collection, transportation, storage and treatment/disposal. Corrective action for wastes from naval ships includes: installation of pipe risers from bilge pumps to deck connections on the main deck to offload oily wastes; increases in waste oil holding tank capacities; installation of reliable tank level indicators; modification of aviation fuel reclamation systems; and, reduction of the volume of bilge wastes. In fiscal year 1974, a military construction program was authorized which includes the improvement of the oil collection and reclamation facilities at Norfolk, Jacksonville, and Oakland. The ship to shore transfer of oily wastes is being improved through the construction of 17 donuts of the closed bottom concept and the design of an oil/water separator system to provide clean-out services for the donuts. (See also W75-10739) (Orr-FIRL)
W75-10750

PORT RECEPTION AND TREATMENT FACILITIES FOR OILY WASTE FROM VESSELS,
Maritime Administration, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10751

OILY BILGE FROM COMMERCIAL VESSELS,
Environmental Quality Systems, Inc., Rockville, Md.
For primary bibliographic entry see Field 5B.
W75-10752

SHIPYARD PROBLEMS WITH OILY WASTES,
For primary bibliographic entry see Field 5B.
W75-10753

CHARACTERISTICS OF OIL POLLUTION IN AND AROUND U.S. WATERS,
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 5B.
W75-10754

A PROGRAM FOR HANDLING EMERGENCY OIL SPILLAGES IN THE PORT OF BALTIMORE,
Maryland Port Authority, Baltimore.
For primary bibliographic entry see Field 5G.
W75-10755

QUALITY PRODUCTS FROM USED PETROLEUM OILS,
B. R. Williams.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Inc., Washington, D.C., p 239-243, 1974.

Descriptors: *Oil wastes, *Oil, *Recycling, *Oil industry, Natural resources, Conservation, Resources development, Pollution abatement, Water pollution sources, Industrial wastes.
Identifiers: *Re-refining, Re-refining industry.

The feasibility and desirability of producing reusable products from waste oil is discussed. A review of the re-refining industry and a profile of the capabilities and benefits of re-refining are presented. The preservation of reusable waste oil to recover the most valuable elements as well as re-refining as a contributor to the solution of the energy shortage are also discussed. The production of reusable products from waste oil is feasible because of the seemingly perpetual characteristics of petroleum oil and it is desirable from the standpoints of both the conservation of irreplaceable natural resources and the abatement of pollution potential. (See also W75-10739) (Orr-FIRL)
W75-10756

THE ECONOMICS OF RE-REFINING,
For primary bibliographic entry see Field 5G.
W75-10757

POLLUTION CONTROL WITH A COMPREHENSIVE WASTE OIL PROCESSING PLANT,
Environmental Quality Systems, Inc., Rockville, Md.
G. D. Gumtz.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Inc., Washington, D.C., p 261-279, 1974. 2 fig, 9 tab.

Descriptors: *Oil wastes, *Waste treatment, *Pollution control, Facilities, Design, Maryland, Ultimate disposal, Incineration, Distillation, Filtration.
Identifiers: *Waste oil recovery/disposal plant.

The design of a plant for the reuse or disposal of waste oils generated in Maryland is discussed. For preliminary design purposes, a single processing facility was postulated which has the potential to treat all the waste oils generated on a state-wide basis. The following design needs were considered: treatment or disposal of all types of waste oils that are collected within Maryland; production of fuel oil; the total waste oil recovery and reuse system need not produce a profit; compliance with all current and projected State and Federal environmental standards; use of existing technology; and, capacity of the plant to be based upon 1975 estimates. Plant design and the specification of unit operations depend on the expected flow(s) for the process in question and the product(s) desired. The following processes were selected to be included in the preliminary design of waste oil processing facility: chemical treatment; settling; flash distillation; absorbent treatment; solvent extraction; and, filtration. Ultimate disposal of process residues and non-recoverable waste oils must be as efficient and environmentally sound as other operations of the plant. Of the six ultimate disposal methods considered, total incineration was chosen because it minimizes the environmental impact of ultimate disposal, produces a concentrated relatively pure residual, places ultimate disposal practices primarily under the control of the processing facility, increases the flexibility of the facility for comprehensive waste oil recovery/disposal, and eliminates any possible oil pollution problems due to process residues. (See also W75-10739) (Orr-FIRL)
W75-10758

EXPERIENCE WITH THE IFP PROPANE CLARIFICATION PROCESS IN RE-REFINING SPENT CRANKCASE OILS,
Institut Francais du Petrole, Paris.
D. Vu Quang, J. W. Andrews, G. Carriero, R. Schieppati, and A. Compte.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Inc., Washington, D.C., p 281-287, 1974. 2 fig, 7 tab.

Descriptors: *Oil wastes, *Waste treatment, *Recycling, *Lubricants, Economics, Oil industry, Sludge, Waste disposal, Pollution abatement.
Identifiers: *Re-refining, Propane/acid/clay treatment.

A process is described which was developed by the French Petroleum Institute (IFP) for propane clarification of spent lube oils prior to conventional acid/clay treatment. The process is simple, and can easily fit into overall re-refining operations. Viscolube Italiana, an IFP licesee, has shown that the IFP process lowers the amounts of acid and clay needed, reduces sludge formation and associated pollution, and improves product quality. The yields are much higher than for conventional acid/clay treatment alone and the plant investment and operating costs are low. The process is well suited for re-refining multigrade motor oils formulated with high concentrations of pour point improvers, viscosity index improvers and other additives, and containing large amounts of varnish, gums and other asphaltic compounds. Four grade of re-refined oil are produced by Viscolube Italiana. These are compared with corresponding lube oils derived from virgin stocks. The color, acid number, and Conradson carbon are better for the propane-clarified oils. Viscolube Italiana has been able to market re-refined oils on a competitive basis with lubricants prepared from virgin stocks. Three industrial plants have been licensed by IFP (Viscolube Italiana, Magnisi Italiana, and a Yugoslavian plant) which are designed for a total of 121,000 tons/year. (See also W75-10739) (Orr-FIRL)
W75-10759

OIL CONTAMINATED WATER RECYCLING SYSTEM,
J. L. Overfield, and J. W. Richard.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Inc., Washington, D.C., p 289-294, 1974.

Descriptors: *Oily water, *Recycling, *Waste water treatment, Equipment, Separation techniques, Oil-water interfaces, Pollution abatement.
Identifiers: Filter/coalescer unit.

Results are discussed of a program to demonstrate an oil contaminated water recycling system which will remove oil from contaminated water to ten ppm and remove solids. The system consists of a filter/coalescer, a solids cleaner, and accessories. The filter/coalescer unit is the main component and is composed of the following principal sections: filter/coalescing cartridges; a backflush system; and, automatic oil discharge system for separated oil. The filter/coalescer unit differs from other similar units in that the automatic backflush mode greatly reduces possible solids plugging of the cartridge; the backflush mode can be operated while the unit is in full service; the unit is mounted horizontally rather than vertically; and, the unit can be used on shore, on board ship or submerged. The water, oil, and solids are first sent into the filter/coalescer unit. The solids are captured in the core of the cartridges and the water and oil pass through the cartridges to the tank of the unit. The oil collects in the oil boot and the water flows out the clean water outlet. The solids are backflushed to the solids cleaner where the oil is removed. Clean water and solids are discharged and the oily water is returned to the filter/coalescer unit. Final testing of the filter/coalescer unit was performed using fresh water and crude oil, simulated sea water and crude oil, and offshore production brine water with oil and production chemicals. (See also W75-10739) (Orr-FIRL)
W75-10760

RE-REFINED DIESEL LOCOMOTIVE LUBRICATING OIL,
W. F. Liebenow.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Inc., Washington, D.C., p 295-297, 1974.

Descriptors: *Oil wastes, *Recycling, *Waste treatment, *Railroads, Economics, Lubricants, Conservation, Pollution abatement.
Identifiers: *Re-refining, Diesel fuel, *Lube oil.

The success that the C and O Railway has had in using re-refined lube oil in their diesel locomotives is described. The C and O from 1952 to 1959, re-refined its own lube oil drainage from diesel locomotives. A batch volume distillation unit with press frame filter was used. Additives were added in mixing tanks and the oil pumped into new oil supply tanks. The oil that was produced by this process met the same specifications that were used for new oil and worked in a diesel locomotive in regular service over a long-period of time as well as new oil. No lubrication problem has ever been discovered that was caused by re-refined lube oil. Economics and an exploded plant caused the C and O to start sending their waste oil out to be re-refined in 1959. The control measures for re-refined oil should be the same as for new oil-- for both products the C and O runs tests to insure compliance with their specification. Disadvantages of re-refining include: collecting and transporting the drainage to the re-refiner and returning the finished product; the necessary close control of the collected material; and, the bias of locomotive builders against re-refined oil. Advantgaes of using re-refined oil include: a net saving over new oil of between 15 to 20 percent; the product varies less than new oil since the C and O gets back their own drainage; the re-refiner will add the additive of the C and O choice; and, re-refining conserves oil. (See also W75-10739) (Orr-FIRL)
W75-10761

WASTE OIL--SOLUTION TO MARYLAND'S ENERGY CRISIS,
Maryland Environmental Service, Annapolis.
J. C. Uhrmacher, and B. L. Pollack.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Incorporated, Washington, D.C., p 301-308, 1974. 1 fig, 6 ref.

Descriptors: *Oil wastes, *Oil, *Maryland, Costs, Environmental effects, State jurisdiction, Legislation, Waste disposal, Ultimate disposal.
Identifiers: Waste reuse.

The possibility of the use of reprocessed waste oil as fuel oil is considered. Technical questions regarding such an application are whether reprocessed waste oil can be burned in presently available furnaces, whether furnace maintenance would then be adversely affected, what environmental effects of burning reprocessed waste oil might be, and what short term and long term market prospects exist for waste oils as fuels. Maryland's Environmental Service is re-assessing the ban on the use of lead-bearing fuels and is at the same time working to provide a state-controlled source of alternative, lead-free fuel oil manufactured at a state-controlled facility. The facility would eventually accept all oily wastes in the state and either provide conversion or ultimate disposal of them. The Maryland Environmental Service hopes to see State legislation passed requiring all waste oils picked up in Maryland to be deposited at State-owned facilities. (See also W75-10739) (Prague-FIRL)
W75-10762

MASSACHUSETTS WASTE OIL MANAGEMENT ACTIVITIES,
Massachusetts Water Resources Commission, Boston. Div. of Water Pollution Control.
D. L. Corey.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse February 12-14, 1974, Washington, D.C., Information Transfer, Incorporated, Washington, D.C., p 309-325, 1974. 1 fig, 6 tab, 4 ref, 1 append.

Descriptors: *Waste disposal, *Oil wastes, *Legislation, *Massachusetts, Industrial wastes, Costs, Planning, Federal jurisdiction, State jurisdiction.
Identifiers: *Re-refining, *Waste management.

Waste oil disposal problems in Massachusetts are discussed. The Massachusetts Division of Water Pollution Control has the level responsibility of controlling collection and disposal of waste oil as well as carrying out management activities. The licensing of waste oil collection and disposal firms is required. The largest volume of waste oil comes from the automotive oil; other sources include hydraulic oils, cutting oils, separators in terminals, railyards, airports, and industrial facilities. Due to economic disincentives such as labelling and exise tax rulings, re-refining of lube oil is no longer practiced in New England, although limited reprocessing of selected waste from fuel oils for special markets still occurs. The research and development programs for oil production control and waste oil disposal were conducted; future planning includes a review of licensing requirements and the use of advanced technology to convert waste oil to valuable products. In addition, the Commonwealth of Massachusetts is hoping that the Federal government will act to remove legal and economic obstructions to re-refining. (See also W75-10739) (Prague-FIRL)
W75-10763

WASTE AUTOMOTIVE LUBRICATING OIL AS A MUNICIPAL INCINERATOR FUEL,
GCA Corp., Bedford, Mass. GCA Technology Div.
S. Chansky, B. McCoy, N. Surprenant, and J. Sahagian.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer Incorporated, Washington, D.C., p 327-365, 1974. 8 fig, 8 tab, 54 ref.

Descriptors: *Municipal wastes, *Oil, Costs, Environmental effects, Oil wastes, Design criteria, Incineration, Monitoring, *Waste treatment.
Identifiers: Automotive lubrication oil, Waste oil, Waste reuse.

The physical and combustion properties of automotive waste oils were demonstrated to be suitable for auxiliary fuel in a municipal incinerator. It was recommended that the effectiveness of burning waste oil be evaluated for alternative designs, locations, and number of waste oil burners necessary. Criteria for effectiveness include stack emissions levels, residue quality, and burner and incineration maintenance problems. It will then be necessary to quantify the waste oil needed in relation to refuse composition and moisture level; to demonstrate and evaluate monitoring and control systems for firing waste oil burners; to demonstrate and evaluate the waste oil storage and feed system performance; and to verify economic estimates as compared to real costs. (See also W75-10739) (Prague-FIRL)
W75-10764

RUNOFF OF OILS FROM RURAL ROADS TREATED TO SUPPRESS DUST,
Edison Water Quality Research Lab., N.J.
For primary bibliographic entry see Field 5B.
W75-10766

THE WASTE OIL INDUSTRY: A DISCUSSION OF SOME ISSUES TO CONSIDER IN PERFORMING AN ECONOMIC ANALYSIS,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-10767

AN ECONOMIC MODEL OF WASTE OIL RECOVERY, REPROCESSING AND DISTRIBUTION SYSTEMS,
Environmental Quality Systems, Inc., Rockville, Md.
E. J. Martin, and L. McMillan.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Incorporated, Washington, D.C., p 405-418, 1974. 4 fig, 4 tab.

Descriptors: *Model studies, *Mathematical models, *Costs, Waste disposal, *Maryland, Operating costs, Capital costs, Profit, *Waste water treatment, Waste treatment.
Identifiers: *Waste oil recovery, Re-refining.

A mathematical model for the economics of waste oil recovery and re-refining has been developed by the Maryland Waste Oil Recovery and Reuse Program. Called the Cost, Revenue, and Profit (CRP) Model, this model calculates the cost of recovery, re-refining and distribution of waste oils. Additionally, it calculates revenues generated by the sale of these products to determine profit or loss. Cost components include: initial investment for real estate, the re-refining plant, collection and distribution systems, and capital for project startup; annual operating cost of the system; annual cost of collection and distribution of oils; cost of insurance; the depreciation of the plant and capital equipment; and cost of operating and investment capital. The model employs interactive factors whereby alternative systems are possible, dependent upon impact. A description of not only costs but also the revenue section of the model is given. Measures such as operating profit, net profit, cash flow, and return on investment dollar indicate the economic viability of any given system. (See also W75-10739) (Prague-FIRL)
W75-10768

UTILIZATION OF SEWAGE EFFLUENT FOR IRRIGATION,
L. C. Halpenny.
In: Agricultural and Urban Considerations In Irrigation and Drainage; Selected Papers from the

Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 575-591, 1974. 1 fig, 4 tab.

Descriptors: *Water reuse, *Sewage effluents, *Irrigation, *Crops, *Arizona, *Southwest U.S., Effluents, Liquid wastes, Sewage treatment, Waste water disposal, Water reuse, Agriculture, Agricultural engineering, Irrigation programs, Irrigation water, Water requirements, Water allocation(Policy).
Identifiers: *Phoenix(Ariz), *Buckeye(Ariz).

The Buckeye Irrigation Company is a nonprofit organization which supplies irrigation water to about 18,000 acres which lie in a strip 19 miles long and about two miles wide along the right bank of the Gila River at the western end of the Salt River Valley of central Arizona. The town of Buckeye is situated within the irrigated area, and is 30 miles west of Phoenix. The area has been under irrigation since 1887, and has had a long and difficult history of maintaining an irrigation water supply. In 1971 a contract agreement was signed with the City of Phoenix under which sewage effluent would be made available to supplement the irrigation water supply of the Buckeye lands. Under this agreement 2500 acre-feet of effluent each month is provided for irrigation for a term of 40 years. (See also W75-10769) (Sims-ISWS)
W75-10798

NUCLEAR POWER PLANT COOLING SYSTEM SELECTION,
Kaiser Engineers, Oakland, Calif.
For primary bibliographic entry see Field 6C.
W75-10822

AUTOMATIC DEVICE FOR THE OPERATIONAL CONTROL OF THE FILTRATION RATE OF SUSPENSIONS(AUTOMATISCHE VORRICHTUNG ZUR TECHNISCHEN KONTROLLE DER FILTRATIONSGESCHWINDIGKEIT VON SUSPENSIONEN),
Technical Univ., Lodz (Poland). Inst. of Chemical Food Technologies.
S. Zagrodzki.
Zeitschrift fuer die Zuckerindustrie, Vol 24, No 8, p 421-423, August, 1974. 1 fig, 10 ref.

Descriptors: *Filtration, *Automation, *Filters, *Aqueous solutions, Design, Construction, Precipitation(Chemical), *Waste water treatment, Operations.
Identifiers: Suspensions.

The capacity of a suspension being filtered is frequently a decisive factor in filtration. Causes of difficulties encountered in the filtering process may be adverse structure of a precipitate or certain properties of a solution. Continuous control of the rate of filtration of suspensions enables measures to be taken rapidly, thus improving conditions in the processes preceding filtration. A device for automatic and continuous control of the capacity of suspensions for being filtered has been designed, constructed, and tested. The apparatus accurately measures the rate of filtration of suspensions through a filtration wall at a known pressure. The filtration wall may then be automatically washed and the rate of filtration of the next suspension portion measured. (Prague-FIRL)
W75-10830

EFFLUENT TREATMENT EQUIPMENT.
Processing, Vol 20, No 11, p 55-56, November 1974. 1 fig.

Descriptors: *Equipment, *Effluents, Waste water treatment, Water treatment, Sludge, Costs, Oil, Water quality, Legislation.
Identifiers: Waste discharge, Effluent treatment, Cost reduction.

Equipment is described which emphasizes the reduction of costs of effluent treatment. With new legislation on water quality of waste discharge streams, efficient treatment is necessary as well as some recovery of waste streams. A system for separating oil from washwater was designed to suit specific effluents and the level of purity required by individual regulations. William Boulton, Ltd., packaged a system for connection to existing drains; the costs are about 40 percent less than existing systems. A small scale interceptor for lighter-than-water pollutants has been manufactured by Conder Hardware Ltd. and offers easy installation and straightforward operation. Its tanks are made of glass-reinforced plastics and PVC connecting pipes and ring seal sockets. Other systems described for effluent treatment are used for solids removal. Two new pieces of equipment are the Accelerator, from the G. F. Dickson Environmental Engineering Ltd. and the Flockation process from Neckar Water Engineering Ltd. These operate by coagulation followed by floc removal and save a great deal of time, space, and capital costs over conventional processes. Sludges produced by water treatment systems can be dewatered by a Winklepress, designed by Simon-Hartley Ltd. and Gebr. Bellmer KG. (Prague-FIRL)
W75-10832

PRINCIPLES OF ESTABLISHING SEWER SYSTEMS IN THE RURAL SETTLEMENTS OF MAGDEBURG COUNTY (GRUNDLAGEN FUER DIE ABWASSER-TECHNISCHE ERSCHLIESSUNG VON LANDGEMEINDEN IM BEZIRK MAGDEBURG),
G. Boelsch, L. Baersch, H. Winter, and S. Petzold.
Wasserwirtschaft-Wassertechnik, Vol 24, No 6, p 199-201, 1974. 1 tab.

Descriptors: *Sewerage, *Rural areas, Percolation, Pipes, Rainfall-runoff relationships, Rain water.
Identifiers: *Magdeburg County(East Germany), Retention basins, Gravity flow.

The principles of establishing sewer systems in the rural settlements of Magdeburg county, East Germany, are presented. The rural sewer systems will be designed to minimize costs and with the possibility of extensive volunteer work. The sewer systems will incorporate pipes 200 or 300 mm in diameter for gravity flow. There will be no discharge possibility from cellars and basements. An improved mixed sewer system with rainwater retention and rainwater purification basins will be adopted. These basins will be designed for a retention time of 10-20 min. (Takacs-FIRL)
W75-10833

INVESTIGATIONS ON THE PRODUCTION OF HYGIENIC COMPOST FROM AIR-DRIED SEWAGE USING DIFFERENT ADDITIVES (VERSUCHE ZUR HERSTELLUNG VON HYGIENISCH EINWANDFREIEM KOMPOST AUS LUFTGETROCKNETEM FAULSCHLAMM UNTER VERWENDUNG VERSCHIEDENER ZUSAETZE),
D. Gaul, D. Strauch, W. Scholl, W. Mueller, and K. Miersch.
Umwelthygiene, Vol 25, No 10, p 227-236, 1974. 5 tab.

Descriptors: *Water purification, *Sewage sludge, Waste disposal, Municipal wastes, Industrial wastes, Sludge drying, Bacteria, *Waste treatment.
Identifiers: Germany, Compost, Biorott.

In the purification plant at Neureut, Germany, the waste water from the Karlsruhe population of 310,000 is purified, along with waste water from 250 industrial facilities. After mechanical separation the sludge is pumped into two digestion towers where it is stored. Liquid sapropel with a water content of 98% is then pumped into earth basins where part of the water is lost through normal drainage. When the water content reaches 75%, the sludge is lifted from the basins and placed in small piles for further drying. This material undergoes drying processes lasting roughly a year and is ground and composed in clumps measuring 2.0 m x 5.0 m x 1.5 m. Various types of typhus or paratyphus bacteria are added to each clump. A substance called Biorott, made of vegetable origin and consisting 80% of various proteins, was tested for its ability to produce pathogen-free compost of dried sewage sludge; it proved to be the most effective substance tested. A pathogen-free compost could only be produced during the warm season between April and October, and additives were necessary for this production. (Nave-FIRL)
W75-10834

WATER QUALITY FACTORS IN DESIGNING A SEWAGE PLANT BASED ON PUBLIC DRAINAGE STATISTICAL DATA, (IN JAPANESE),
S. Ebina.
Gesuido Kyokai-shi, (Journal of Japan Sewage Works Association), Vol 12, No 129, p 36, February 1975. 9 tab, 8 ref.

Descriptors: *Waste water treatment, *Water quality control, Sewage, *Design criteria, *Treatment facilities, Suspended solids, Biochemical oxygen demand, Drainage, Data analysis.
Identifiers: Sewage plants, Sludge volume index.

Data on sewage water quality collected from over 200 sewage plants were treated statistically to design guidelines for future plant constructions. The average rate of waste water discharge per person in 1970 was 500 liter/day reaching to the average capacity of sewage plants of 700 liter/day person. The BOD value in untreated sewage water was almost the same in 1969 and 1970 (134 mg/liter and 125 mg/liter respectively); however, the suspended solids in corresponding years were 197 mg/liter and 175 mg/liter. The average contributions of BOD and SS to the sewage water in 1970 were 44 g/day person and 40 g/day person respectively. The stability of water treatment efficiency is related to the capacity of tanks used for treating sludge, such as conventional and step-aeration tanks. The sludge volume index value in 1970 ranged between 50 to 150. Therefore, future plants must have the tank capacity to provide for a sludge volume index of 300. The digestion tanks in the future plants are estimated to provide for 50 to 60 percent conversion efficiency of organic materials in untreated sludges. (Katayama-FIRL)
W75-10838

RATE OF PHOSPHORUS UPTAKE BY ACTIVATED SLUDGE,
San Antonio Municipal Wastewater Treatment Plant, Tex.
W. N. Wells.
Water and Sewage Works, Vol 122, No 1, p 36-39, January, 1975. 10 fig, 9 ref.

Descriptors: Phosphorus, *Waste water treatment, *Recycling, Nutrient removal, Laboratory investigations, Activated sludge, Sewage treatment, Texas, Absorption.
Identifiers: *Phosphorus uptake rate, *Phosphorus removal, Waste activated sludge, San Antonio(Tex).

A method of recycle of phosphorus from waste water is described, utilizing waste activated sludge as the stream for phosphorus removal. The rate at which phosphorus is taken up by an activated sludge appears to be an important characteristic in phosphorus removal. Determination of the uptake rate has been standardized in the laboratory whereby: a sample of sludge is mixed with primary effluent and aerated; samples are drawn at intervals and filtered through qualitative filter paper;

the filtrate is analyzed for orthophosphate; a curve of phosphorus remaining in the filtrate versus time is plotted; and the steepest portion of the curve is taken to be uptake rate in mg/liter/hr. Two criteria for effective phosphorus removal are considered. These are that enough solids be produced and that phosphorus can be incorporated into the sludge. Experiments to condition activated sludge to increase its amount of phosphorus uptake are discussed, particularly those from a San Antonio, Texas, sewage treatment plant. (Prague-FIRL)
W75-10839

TREATMENT OF SERVICE WATER WITH OZONE,
N. Tabata, and M. Mori.
Mitsubishi Denki-Giho, Vol 48, No 5, p 639-645, May, 1974. 17 fig, 6 ref.

Descriptors: *Ozone, *Activated carbon, *Waste water treatment, Chemical treatment.
Identifiers: *Service water, *Deodorisation, *Japan.

Ozone treatment of service water is being practiced in European countries. In Japan, it is being studied as a method to deodorise service water. Ozone treatment presents several technical problems which require further investigation because of the differences in conditions of Japanese and European service water. The first question asked was whether ozone treatment or activated carbon treatment is superior in its deodorising effect. Reports on the study of this question show that the ozone treatment is more effective than activated carbon. Many problems of treatment technique such as the nitric acid radical, residual ozone in water, and ozone decomposition of exhaust gas are discussed. The performance of a contact tank of gas and liquid which is the most important part of a study of treatment devices is also discussed. (Orr-FIRL)
W75-10840

THE CONSEQUENCES OF ACCEPTING INDUSTRIAL WASTES INTO SEWERS; WATER POLLUTION RESEARCH AT STEVENAGE,
Water Pollution Research Lab., Stevenage (England).
J. Borne.
Chemistry and Industry, No 1, p 1, 13-17, January 4, 1975. 2 fig, 1 tab, 5 ref.

Descriptors: *Legislation, *Waste disposal, *Industrial wastes, Sewers, Laboratory tests, Pretreatment, Water quality, Sewage, Organic matter, *Waste water treatment.
Identifiers: Great Britain, Physico-chemical treatment.

Possible legislation governing the discharge of effluents from various industries into municipal sewers was discussed. One aspect of this work was a series of laboratory investigations conducted by the Water Research Centre at Stevenage. In compliance with legislation, a form of Consent is necessary for any industry to discharge into sewer waters. The Consent specifically restricts materials such as petroleum spirit and organic solvents, as well as controlling temperature, flow rate, and pH. Difficulties and high costs associated with accepting such trade effluents are related to three aspects of sewage treatment--anaerobic sludge digestion and dewatering of sewage sludge, biological oxidation, and disposal of the treated effluent. The Laboratory has the biodegradability of constituents of industrial waste waters in admixture with sewage, using batch tests in several proportions. They also investigated the possible effects of inhibitory chemicals on the process of nitrification. Techniques are discussed for physio-chemical partial pre-treatment methods, so as to reduce the strength of industrial wastes before their discharge to a local authority sewer. Evaluations have also been made of disposal of the treated effluent in the framework of water reuse and stricter water quality requirements for sewage effluents. (Prague-FIRL)
W75-10842

THE TOXICITY OF HEAVY METAL IONS TO ANAEROBIC DIGESTION,
Water Pollution Research Lab., Stevenage (England).
F. E. Mosey, and D. A. Hughes.
Water Pollution Control, Vol 74, No 1, p 18-39, 1975. 16 fig, 2 tab, 10 ref.

Descriptors: *Toxicity, *Heavy metals, *Anaerobic digestion, *Sewage treatment, Sludge, Sulfides, *Pollutant identification, Analytical techniques, Ions, *Waste water treatment, Enzymes.
Identifiers: Heavy metal ions.

Certain heavy metal ions can inactivate enzymes by reacting with their sulphydryl groups, thus inhibiting the growth of organisms. It was implied that a relationship exists between the concentration of sulfide ions and the degree of inhibition by metals. This degree of inhibition must be ascertained for the control of anaerobic digesters. Sludge from detergent-free sewage was examined. Digesters were each charged with 2 liters of actively digesting sludge from a breeder digester and operated; solutions of various metal salts were each added 19 days later. Feed to each digester was 80 ml of raw sludge plus the required volume of salt solution; the mixtures were then stirred and let stand for an hour. Rate of feeding corresponding to a mean period of detection of sludge in the digester of 20 days. Raw and digested sludges were analyzed and volume of gases produced daily and per unit of volatile matter destroyed by digestion recorded. The silver/silver sulfide electrode was a reliable analytical tool to measure sulfide ion concentration(ps) values. A pS value over 14.0 in a digesting sludge indicated the presence of inhibitory concentrations of the heavy metal ions Zn++, Cd++, Fe++, Cu++, or Cu++, when oxidizing agents were absent. Neutralization of zinc toxicity by precipitation of zinc as zinc carbonate requires a pH value of about 7.6. Ferric ions are reduced to ferrous ions and cupric ions to cuprous ions during anaerobic digestion. (Prague-FIRL)
W75-10843

5E. Ultimate Disposal Of Wastes

STUDY OF SOLID WASTE MANAGEMENT PRACTICES IN THE PULP AND PAPER INDUSTRY.
Gorham International, Inc., Maine.
For primary bibliographic entry see Field 5D.
W75-10366

WASTE WATER TREATMENT: LAND DISPOSAL OF WASTE WATER,
New York State Dept. of Environmental Conservation, Albany.
T. J. Tofflemire, and R. A. Farnan.
Journal Water Pollution Control Federation, Vol 47, No 6, p 1344-1352, June , 1975. 111 ref.

Descriptors: *Reviews, *Bibliographies, *Waste water disposal, *Irrigation, Irrigation effects, Technology, Nutrients, Underground waste disposal, Waste disposal wells, Injection wells, Municipal wastes, Industrial wastes, Soil disposal fields, Flow, Dispersion, Pollutants, Arizona.
Identifiers: Flushing Meadow Project(Arizona).

This is a review of the 1974 literature dealing with land disposal of waste waters. It covers general principles, surveys and conferences on land disposal, individual land waste water disposal systems (e.g., Flushing Meadow Project west of Phoenix, Arizona), technical aspects (soil clogging, water flow, dispersion of pollutants, etc.), nutrient travel in the soil, and deep well disposal. (Witt-IPC)
W75-10373

WASTE WATER TREATMENT: SLUDGE TREATMENT, UTILIZATION, AND DISPOSAL,
Delaware Univ., Newark. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W75-10395

PROBLEMS ENCOUNTERED IN SLUDGE TREATMENT AND SOME ADVANCED SOLUTIONS,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
J. E. Smith, Jr.
In: TAPPI Environmental Conference, Denver, Colorado, May 14-16, 1975, Preprinted Proceedings (TAPPI, Atlanta, Georgia), p 11-34. 7 fig, 25 ref, 15 tab.

Descriptors: *Sludge treatment, *Sludge disposal, *Pulp and paper industry, *Waste treatment, Water pollution sources, Wastes, Industrial wastes, Solid wastes, Sludge, Stabilization, Dewatering, Activated sludge, Phosphorus compounds, Lime, Aerobic treatment, Thermophilic bacteria, Sludge digestion, Filtration, Pressure, Capillary action, Waste disposal.

Current problems faced in sludge handling and disposal are reviewed, and some new techniques for sludge handling are enumerated. The discussion covers alternative sludge stabilization and conditioning processes, dewatering techniques, reduction processes (processes that reduce the volatile sludge solids), and disposal methods. The sources, quantity, and characteristics of sludges in the pulp and paper industry are specified, along with handling and disposal processes and costs. Waste sludges originating from the activated sludge process and newer effluent treatment methods (e.g., those used for phosphorus removal or upgrading of plant performance) present the greatest challenge in dewatering. Recently developed treatment methods which show promise for more efficient sludge handling are detailed, including lime stabilization, thermophilic aerobic digestion, ash conditioning of sludge for improved dewatering, top-feed rotary vacuum filtration, capillary dewatering, and pressure filtration. (Sykes-IPC)
W75-10398

GUIDELINES FOR LANDFILL OF TOXIC INDUSTRIAL SLUDGES,
New York State Dept. of Environmental Conservation, Albany. Div. of Pure Waters.
For primary bibliographic entry see Field 5G.
W75-10487

PROGRAM FOR CONTROL OF DISCHARGES OF POLLUTANTS TO NAVIGABLE WATERS.
For primary bibliographic entry see Field 5G.
W75-10608

JETTISONING OF LNG AT SEA--AN UNRESOLVED POLLLUTION HAZARD.
For primary bibliographic entry see Field 5G.
W75-10633

SLUDGE DISPOSAL ON AGRICULTURAL SOIL,
Ohio State Univ., Columbus. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W75-10674

DISPOSAL OF LIQUID EFFLUENT BY LAND IRRIGATION AT LAGRO CELOTEX PLANT,
Celotex Corp., Lagro, Ind.
For primary bibliographic entry see Field 5D.
W75-10679

DISPOSAL OF DIGESTED SEWAGE SLUDGE BY LANDFILL,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W75-10682

LAND TREATMENT OF MUNICIPAL SEWAGE,
For primary bibliographic entry see Field 5D.
W75-10719

PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON WASTE OIL RECOVERY AND REUSE.
Association of Petroleum Re-Refiners, Washington, D.C.
For primary bibliographic entry see Field 5D.
W75-10739

DISPOSAL AND/OR RECYCLE OF AIR FORCE WASTE PETROLEUM OILS AND LUBRICANTS,
For primary bibliographic entry see Field 5D.
W75-10749

THE NAVY'S OILY WASTES HANDLING AND DISPOSAL PROGRAM,
Naval Material Command, Washington, D.C.
For primary bibliographic entry see Field 5D.
W75-10750

POLLUTION CONTROL WITH A COMPREHENSIVE WASTE OIL PROCESSING PLANT,
Environmental Quality Systems, Inc., Rockville, Md.
For primary bibliographic entry see Field 5D.
W75-10758

EXPERIENCE WITH THE IFP PROPANE CLARIFICATION PROCESS IN RE-REFINING SPENT CRANKCASE OILS,
Institut Francais du Petrole, Paris.
For primary bibliographic entry see Field 5D.
W75-10759

WASTE OIL--SOLUTION TO MARYLAND'S ENERGY CRISIS,
Maryland Environmental Service, Annapolis.
For primary bibliographic entry see Field 5D.
W75-10762

MASSACHUSETTS WASTE OIL MANAGEMENT ACTIVITIES,
Massachusetts Water Resources Commission, Boston. Div. of Water Pollution Control.
For primary bibliographic entry see Field 5D.
W75-10763

WASTE AUTOMOTIVE LUBRICATING OIL AS A MUNICIPAL INCINERATOR FUEL,
GCA Corp., Bedford, Mass. GCA Technology Div.
For primary bibliographic entry see Field 5D.
W75-10764

ART OF AGRICULTURAL DRAINAGE DESIGN AND COSTS,
Wright Water Engineers, Inc., Denver, Colo.
For primary bibliographic entry see Field 4A.
W75-10797

UTILIZATION OF SEWAGE EFFLUENT FOR IRRIGATION,
For primary bibliographic entry see Field 5D.
W75-10798

INVESTIGATIONS ON THE PRODUCTION OF HYGIENIC COMPOST FROM AIR-DRIED SEWAGE USING DIFFERENT ADDITIVES (VERSUCHE ZUR HERSTELLUNG VON HYGIENISCH EINWANDFREIEM KOMPOST AUS LUFTGETROCKNETEM FAULSCHLAMM UNTER VERWENDUNG VERSCHIEDENER ZUSAETZE),
For primary bibliographic entry see Field 5D.
W75-10834

5F. Water Treatment and Quality Alteration

ORGANIC MATTER IN NATURAL WATER AND WATER TREATMENT,
New Hampshire Univ., Durham. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W75-10351

PROBLEMS OF SPACE BIOLOGY. VOLUME 24. THE WATER SUPPLY OF SPACECRAFT CREWS,
For primary bibliographic entry see Field 5D.
W75-10365

USE OF ORGANIC FLOCCULANTS FOR TEXTILE PLANT WATER TREATMENT (POUZITI ORGANICKYCH FLOKULANTU K CIRENI VODY PRO TECHNOLOGII TEXTILNI VYROBY),
J. Stanek.
Textil, Vol 30, No 1, p 17-18, 1975.

Descriptors: *Water treatment, *Flocculation, *Pre-treatment(Water), Water purification, Textiles, Separation techniques, Filtration, Zeta potential, Suspended solids, Organic compounds, Filters, Sands, Particle size, Industrial water, Surface waters, Waste water treatment.
Identifiers: Sand filters, Textile industry, Nalco 600 flocculant.

The mechanism of water contact filtration includes formation of a positively charged layer of polycoagulant on the filter sand particles. Negatively charged suspended and colloid particles in water passing through the sand layer are then held on the sand particle surfaces due to electrokinetic forces. Laboratory-scale tests with contact filtration were carried out using two sizes of sand particles in the filter model. With regard to the removal of undissolved solids from raw surface water, the Nalco 600 polyflocculant gave the best results. (Trubacek-IPC)
W75-10383

HOW TO PURIFY EFFLUENTS, RECOVER BYPRODUCTS WITH REVERSE OSMOSIS,
Union Carbide Corp., Tuxedo, N.Y.
I. K. Bansal.
Pulp and Paper, Vol 49, No 5, p 118-121, May 1975. 4 fig, 7 ref, 3 tab.

Descriptors: *Reverse osmosis, *Waste water treatment, *Sulfite liquors, *Bleaching wastes, *Byproducts, Wastes, Industrial wastes, Waste treatment, Water pollution sources, Membrane processes, Separation techniques, Water purification, Design, Membranes, Water quality control, Water pollution treatment, Lignins, Carbohydrates, Organic compounds, Equipment, Recycling.
Identifiers: Sugars, Spent sulfite liquor, Lignosulfonates.

Reverse osmosis is the term used for the process of filtering solute molecules or particles of the same order of magnitude as those of the solvent (normally water), while ultrafiltration refers to filtering of solute molecules at least 1-2 orders of magnitude larger than the solvent molecules. The fundamentals of membranes processes are explained with the aid of diagrams, and it is pointed out that one of the major problems facing users of a reverse osmosis process is the limited life of the membrane elements. An improved membrane design called the sand matrix module has been developed by Westinghouse Electric Corp. to overcome many weaknesses of the older type of membranes. The results of experimental studies are presented and discussed, showing that membrane processes are feasible for purifying the caustic extraction stage effluent from a bleached kraft mill and for recovering sugars and lignosulfonates from spent sulfite liquor. For industrial usage, membrane modules must have a minimum life expectancy of 12 months, and preferably 3 years. Experimental work at The Institute of Paper Chemistry has indicated that the newer type membrane modules may be close to reaching the life expectancies and throughput rates required for continuous commercial operations. (Witt-IPC)
W75-10391

SAFE DRINKING WATER HAS BECOME A FEDERAL CASE.
For primary bibliographic entry see Field 5G.
W75-10469

REMOVAL OF TRACE METALS DURING CONVENTIONAL WATER TREATMENT,
G. M. Zemansky.
Journal of the American Water Works Association, Vol 66, No 10, p 606-609, October 1974. 5 fig, 3 tab, 16 ref.

Descriptors: *Trace elements, *Water treatment, *Heavy metals, *Water pollution treatment, Water pollution, Toxins, Cadmium, Chromium, Copper, Iron, Lead, Manganese, Molybdenum, Nickel, Zinc, Pollutant identification.

Twelve water-treatment plants were sampled. Treatment plant performance was evaluated on its ability to remove a given trace metal. Percentage removals were also calculated for individual components, such as clarifiers and filters. Analyses by both x-ray emission and atomic-absorption spectrophotometer (AA) wet chemistry were performed, so the methods could be compared. Chromium appeared to be slightly removed by microstrainers and clarifiers but generally not removed by filters. Cu was slightly removed by microstrainers and removed increasingly well by clarifiers and filters. For both iron and manganese, relatively high percentage removals in the clarifier were followed by higher percentage removal in the filters. Consistently low percentage removals of Molybdenum were obtained with all components and the plant as a whole. For nickel, only a limited number of data points were obtained and these indicated negligible removal by microstrainers and moderate removal by clarifiers and filters. The zinc percentage removal data were scattered. Detectable concentrations of cadmium and silver were not observed in the source waters analyzed. (Pulliam-Vanderbilt)
W75-10501

TREATMENT PROCESSES FOR COPING WITH VARIATION IN RAW-WATER QUALITY,
National Environmental Research Center, Cincinnati, Ohio. Water Supply Research Lab.
J. M. Symons, and G. G. Robeck.
Journal of the American Water Works Association, Vol 67, No 3, p 142-145, March, 1975. 1 tab, 36 ref.

Descriptors: *Water purification, *Demineralization, *Water quality control, *Water treatment, Aeration, Desilting, Chlorination, Disinfection, Flocculation, Desalination processes, Filtration, Electrodialysis, Reverse osmosis, Oxidation, Water softening, Nutrient removal, Waste water treatment.

Available treatment techniques for removing about 20 different raw water contaminants to meet drinking water standards are presented to help plant designers and operators understand the problems. Treatment feasibility rather than cost is considered. Some common time-varying problems, such as turbidity, discoloration, and hardness can best be dealt with through close monitoring of raw water with frequent jar tests. Good operations records show how much of which treatment produces good quality finished water from a given condition of raw water. Other problems such as odor are best dealt with by continual use of activated carbon beds. Chlorine disinfection requires close monitoring of organic matter, ammonia, and reducing substances so that the dosage will provide a target chlorination residual. Raw water contaminants particular to a specific location are a plant design problem. Turbidity removal by recently improved mixing, flocculation, settling, and sand filtration methods is discussed. Adsorption and oxidation variations for removal of organics are presented. Inorganics, such as calcium hardness, iron, manganese, nitrates, mercury, hydrogen sulfide, and 5 geochemical contaminants are examined. Reverse osmosis and electrodialysis are suggested for removal of sulfates, chlorides, and sodium which have soluble salts and are therefore not susceptible to precipitive techniques. (Herr-North Carolina)
W75-10705

THE MASTER PLAN FOR WATER-SUPPLY IN THE REGIONAL MUNICIPALITY OF OTTAWA-CARLETON,
Ottawa-Carleton Regional Municipality, Ottawa (Ontario).
For primary bibliographic entry see Field 3D.
W75-10710

DETERIORATION OF WATER QUALITY IN DISTRIBUTION SYSTEMS,
Missouri Univ., Columbia. Dept. of Civil Engineering.
J. T. O'Connor, L. Hash, and A. B. Edwards.
Journal of the American Water Works Association, Vol 67, No 3, p 113-116, March 1975. 4 fig, 4 tab.

Descriptors: *Distribution systems, Water supply development, *Water quality control, *Deterioration, *Corrosion, *Bacteria, *Water treatment, *Microorganisms, Decomposing organic matter, Deaeration, Nutrient removal, Aquatic bacteria, Yeasts, Water purification, Chlorination, Carbon filters, *South Dakota, Water pollution sources.
Identifiers: *Sioux Falls(SD).

The Sioux Falls, South Dakota, water-supply system was thoroughly examined to determine the role of bacteria in water quality deterioration. The water in Sioux Falls is treated for softening and iron and manganese removal. It is chlorinated. flouridated, and treated with glassy zinc phosphates. Sampling shows that after distribution it has a higher iron content indicating corrosion of cast-iron mains. The chlorine residual which starts at approximately 1 mg/l and dissolved oxygen both diminish with distance from the plant. Samples from main flushing were analyzed. Over 30 microorganism types were found, indicating a stable population that cannot easily be eradicated. Through bioflocculation bacterial growths can accumulate a biological slime in pipes containing iron particles, calcium carbonate, and other debris. During high flow these accumulations are dislodged and go into suspension. Bacterial wastes and decomposition produce off-tastes. Bacteria can reduce sulfates to hydrogen sulfide and also produce methane which destroy chlorine residuals and ruin water quality. Corrosion can be accelerated by CO2 generation. Chlorination, especially with lowered pH, can inhibit bacteria but rechlorination may be needed in the system. Removal during treatment of substances which promote bacterial growth, particularly organic carbon (measured as COD) may be most effective. Main flushing is the other alternative. (Herr-North Carolina)
W75-10711

WATER AND WASTEWATER FACILITIES FOR FLORIDA HOUSING DEVELOPMENTS,
Singer Co., Bridgeport, Conn. Water Resources Div.
For primary bibliographic entry see Field 5D.
W75-10717

WATER SUPPLY FROM RENOVATED WASTEWATER--A RESOURCE MANUAL FOR MASSACHUSETTS PLANNERS, PUBLIC OFFICIALS AND CITIZEN GROUPS.
Clark Univ., Worcester, Mass.
For primary bibliographic entry see Field 5D.
W75-10722

5G. Water Quality Control

THEORETICAL AND APPLIED CONCEPTS OF WATER RESOURCES FOR SOCIAL WELFARE.
Auburn Univ., Alabama. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W75-10354

THE ECONOMIC IMPACT OF MERCURY POLLUTION ON FISHERIES AND OTHER RELATED BUSINESSES AROUND PICKWICK LAKE,
Auburn Univ., Alabama. Dept. of Economics.
J. W. Granade, and D. R. Street.
School of Business Research Series 4, November 1973, p 8-41, 6 fig, 21 tab, 2 ref.

Descriptors: *Economic impact, *Commercial fishing, *Water pollution effects, Mercury, Income analysis, Recreation.
Identifiers: *Opportunity cost, Recreation industry, Pickwick Lake(Ala).

A ban on commercial fishing in Pickwick Lake, Alabama was imposed as a result of the discovery by the FDA of mercury concentrations exceeding prescribed limits. The economic effects of the mercury pollution and the subsequent fishing ban on the income of commercial fishermen and recreation related businesses are assessed. Holders of commercial fishing licenses who fished for added income were surveyed to determine these effects. Each fisherman was asked to estimate the proportion of his total income derived from fishing and his net income per month before and after the ban. A loss of total fishing income occurred in Pickwick Lake and in the adjacent Wilson and Wheeler Lakes. An analysis to determine the opportunity cost of the pollution indicated that total income increased for two fishermen, remained the same for five and decreased for fifteen as a result of post-ban alternative employment oppportunities. The effects on recreation related businesses were determined for the communities of Waterloo, Florence, Cherokee and Tuscumbia by comparing retail sales figures for the six months prior to the ban to those for the six months after the ban. No sizeable decline in sales was observed in any of the four communities. (See also W75-10354) (Becker-Wisconsin)
W75-10356

INTERNATIONAL PRODUCTION ASPECTS OF WATER AND ENVIRONMENTAL QUALITY CONTROL,
Auburn Univ., Alabama. Dept. of Economics.
A. W. Lacy.
School of Business Research Series 4, November 1973, p 42-57, 10 ref. OWRT B-037-ALA(1).

Descriptors: *Economic impact, *Water quality control, *Pollution abatement, *Foreign trade, Tariff, Pollution taxes(Charges), National income.
Identifiers: *Externalities, *Social equilibrium, *Exchange rates, Transboundary spillovers, Environmental quality control.

Pollution abatement need not necessarily destroy the international competivity of the domestic economy that wishes to protect its environment. The question of whether businessmen who compete in international markets and whose costs of production are increased by pollution control laws should be protected from competition from polluting, lower cost producers is discussed. The disutility caused by pollution must be covered by the price paid by the consumers if social equilibrium is to be attained. The assumption is made that it is impossible to compare the utility gain of those who whould benefit by the removal of the externality with the utility loss of those who must pay higher prices. If the employment of the best technical method of production to remove the externality (pollution) is forced, economically penalized firms must be aided if they are to remain competitive internationally. Pros and cons of tariffs and adjustable exchange rates between countries are presented. If transboundary spillovers do not exist, fluctuating exchange rates will restore social equilibria without the administrative and equity problems of a tariff. The existence of transboundary spillovers necessitates the imposition of a tariff whose success is curtailing the spillover depends on all countries acting in concert against the polluting country. (See also W75-10354) (Becker-Wisconsin)
W75-10357

INDUSTRIAL INTERDEPENDENCIES AND EXTERNAL DISECONOMIES OF WATER RESOURCES,
Auburn Univ., Alabama. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W75-10358

POLLUTION CONTROL AND OPTIMAL TAXATION: A STATIC ANALYSIS,
University Coll., London (England). Dept. of Political Economy.
For primary bibliographic entry see Field 6E.
W75-10359

NEW LEGISLATIVE TENDENCIES FOR CONTROL OF WATER POLLUTION (NUEVAS TENDENCIAS LEGISLATIVAS EN EL CONTROL DE LA CONTAMINACION DE LAS AGUAS),
Centros de Estudios, Investigaciones y Aplicaciones del Agua, Granada (Spain).
I. Aparicio Ferrater.
Investigacion y Tecnica del Papel, Vol 12, No 44, p 319-365, April, 1975. 23 ref, 6 tab.

Descriptors: *Legislation, *Water pollution control, *Europe, Foreign countries.
Identifiers: France, Belgium, Holland, Great Britain, Czechoslovakia.

Legislation for water pollution control which has been enacted in France, Belgium, Holland, Great Britain, and Czechoslovakia within the past few years is summarized. (Sykes-IPC)
W75-10384

WATER-QUALITY REQUIREMENTS FOR THE PETROLEUM INDUSTRY,
Neptune MicroFloc, Inc., Corvallis, Oreg.
For primary bibliographic entry see Field 5D.

W75-10465

USCG SETS BROADER USE OF POLLUTION CONTROL SYSTEMS,
Coast Guard, Washington, D.C. Office of Marine Environment and Systems.
R. I. Price.
Sea Technology, Vol 16, No 1, p 30-31, January 1975.

Descriptors: *Water pollution control, Legislation, *Oil spills, *Oil pollution, Water pollution sources, Equipment, Water quality standards, Pollution abatement, *Pollutant identification, Instrumentation.
Identifiers: Offshore facilities, *Pollution sensors, Oil recovery.

In compliance with new discharge regulations effective since July 1, 1974, a system of surveillance was required to insure earliest possible notice of discharges of oil. The Coast Guard has developed an Airborne Oil Surveillance System. The prototype consists of four pollution sensors. A system of forensic identification and classification of oil spills should make the identification of source more reliable. If the discharge source is among the sources samples, the system should identify the source 99.9% of the time. Further research and development is planned, including new high seas oil barriers, and modification of recovery and containment equipment for use in Arctic climates. With these systems, oil discharge prevention and clean-up from both onshore and offshore facilities transferring oil in bulk to or from vessels should be accomplished. (Prague-FIRL)
W75-10466

CIVIL ENGINEERING LABORATORY DEVELOPS UNIVERSAL CONNECTOR FOR ALL BOOMS.
Sea Technology, Vol 16, No 1, p 16, January 1975. 1 fig.

Descriptors: *Oil spills, *Water pollution control, Equipment, Design criteria, California, Oceans, Oil pollution, *Pollution abatement.
Identifiers: *Oil booms, *Universal connectors.

Essential factors in containing an oil spill are speed and efficiency in completing the operation. This is often inhibited by the time required to connect most commercial oil booms with the variable size interconnecting devices. The Civil Engineering Laboratory (CEL), Naval Construction Battalion Center at Port Hueneme, California, has developed a universal boom connector. This piece of equipment allows sections of different types and sizes to be connected quickly. The CEL design has been accepted by the Navy as a connector for all new booms; presently 200 commercial firms are making these booms. The CEL design consists of extruded aluminum male and female connectors configured for simple attachment to the ends of already available boom sections. The two booms can be connected in one minute by two men working from a boat, even in rough seas, because the connectors do not have to be aligned. The connector is then attached to the boom by bolts and a metal plate; the connector is held up to the boom under tensile loads by a rod running the full height of the boom. (Prague-FIRL)
W75-10468

SAFE DRINKING WATER HAS BECOME A FEDERAL CASE.
Chemical Week, Vol 115, No 22, p 46, 51, November 1974.

Descriptors: *Public health, *Potable water, *Standards, *Legislation, Water supply, Water treatment, Water purification, Chlorine, Ozone, Chemical industry, Oil industry, *Water quality standards.
Identifiers: *Safe Drinking Water Act, Carcinogens, Hydrogen peroxide.

The discovery of alleged carcinogens in drinking water from the Mississippi River is accelerating the demand for federal drinking water standards. The Safe Drinking Water Act of 1974 was passed by the Senate late last year; the House has recently enacted their version. The bills do not specify drinking water standards or methods of treatment. Instead they require the EPA to propose standards within 90 days of enactment, and make the standards final within another 90 days. The House version of the bill requires the EPA, with the assistance of the National Academy of Sciences, to determine maximum contaminant levels as well as the contaminants which may have an adverse effect on the health of humans. Federal drinking water standards could be a mixed blessing for the chemical industry--sales of water treatment chemicals would be boosted but new restrictions on plant effluents and on use of some chemicals might also result. The oil industry is objecting to the bill as it would prohibit underground water injection which is currently used to help extract oil from depleted wells. Disinfection by chlorination is also under investigation. It is thought that some of the byproducts of chlorination might possibly be carcinogenic. Ozone and hydrogen peroxide can be used as substitutes for chlorine. Ozone has been used to eliminate phenols from Whiting, Indiana, water for almost 20 years. Costs of meeting new water quality standards, that will result if the new bill becomes a law, will be high, perhaps a doubling or tripling of existing costs. (Orr-FIRL)
W75-10469

EPA'S EFFLUENT GUIDELINES HAVE THEIR DAY IN COURT.
Chemical Week, Vol 115, No 18, p 33-34, October 30, 1974.

Descriptors: *Legislation, Federal jurisdiction, Water Pollution Control Act Amendments, Industrial wastes, Effluents, Chemicals, Environmental effects, *Water pollution control, *Water quality standards.
Identifiers: Chemical process industry, *Effluent guidelines.

Out of 30 guidelines issued by the EPA under its interpretation of the Water Pollution Control Act Amendments, 21 have been challenged in court. The major challengers are the chemical process industries, who disagree with the legal interpretations of 'best practical' (for 1977) and 'best available' (for 1983) pollution controls. Inorganic chemicals guidelines have already been challenged in court and other petitions for future review include those against guidelines for organic chemicals, soaps, detergents, phosphates, plastics and synthetics, rubber, nonferrous metals, petroleum refining, fertilizers, pulp and paper, and textiles. Three main arguments have been set forth: although Congress intended guidelines for use by states and regional EPA offices in setting effluent limits for individual permits, the guidelines for existing plants have been treated by EPA as mandatory national standards; EPA did not follow the 1972 Act amendments in carrying out cost-benefit analyses to determine whether the proposed additional cleanup costs bring sufficient return in environmental improvement; and EPA based its pollution control guidelines on a few exemplary plant operations, not considering problems of older plant performance, or of climatic and regional differences. Discharge permits for industrial plants were to have all been issued by December 31, 1974. It was expected that less than two-thirds of these will have been issued by the deadline. Legal maneuvering is expected to continue, due to the ambiguities of the Act. (Prague-FIRL)
W75-10470

P. L. 92-500 (TWO YEARS LATER) IS NOT THE ANSWER,
C. W. Heckroth.
Water and Wastes Engineering, Vol 11, No 12, p 34-40, December, 1974.

Descriptors: *Federal Water Pollution Control Act, Waste water, Industrial water, Federal jurisdiction, State jurisdiction, Water pollution control, Costs, Legislation, *Water quality standards, Industrial wastes.
Identifiers: Effluent guidelines, *P. L. 92-500.

P. L. 92-500 (the Federal Water Pollution Control Act) industrial cost recovery provisions have been called discriminatory against industry unless residential and commercial connectors also are required to return their share of federal grants for facilities construction. At the annual meeting of the Water Pollution Control Federation in Denver, both P. L. 92-500 and the EPA position were criticized for the ambiguity of zero discharge provisions, the substantial demands imposed upon the States, the missed or unrealistic deadlines, the uncooridinated planning requirements, almost total federal control of the programs, paperwork in huge proportions, and the lack of practical experience of water pollution control of a large number of personnel at the Washington EPA level. Recommendations supported by State water pollution control administrators included: EPA regulations and guidelines be simplified; more responsibility be given to states and regions; planning requirements be made realistic; State Program Grants be restructured so that funds are provided to States to develop their own individual programs; and a simple program for monitoring progress be devised. (Prague-FIRL)
W75-10471

FEASIBILITY TEST PROGRAM OF APPLICATION OF COALESCING PHASE OIL/WATER SEPARATORS TO SELF COMPENSATING FUEL TANKS IN SURFACE SHIPS,
General Electric Co., Philadelphia, Pa. Re-entry and Environmental Systems Div.
J. B. Arnaiz, and E. Batutis.
Available from the National Technical Information Service, Springfield, Va. 22161, as AD-784 105, $7.25 in paper copy, $2.25 in microfiche. Coast Guard Report CG-D-88-74, May, 1974. 90 p, 17 fig, 7 tab, 6 ref. DOT-CG-24,290A.

Descriptors: *Oily water, *Separation techniques, *Water pollution control, *Oil-water interfaces, Oil wastes, Oil pollution, Fuels, Feasibility studies, Pollution abatement.
Identifiers: Coalescing plates, *Oil/water separators.

An evaluation was performed of the General Electric Coalescing Plate Oil/Water Separator concept as applied to ballast water discharged from a ship that has self compensating fuel tanks. Flow rates of up to 1200 gallons per minute were processed. At all times, the amount of oil discharged in the effluent of the separator was 5 ppm or less. The influent oil values to the separator were as high as 800 ppm and at the end of the test the influent to the separator contained almost 100 percent oil. A commercially available General Electric OPC-100 oil/water separator was chosen for the tests because it has a cross sectional area and volume very close to the equivalent of a DE-1040 forward fuel tank. On-line measurements of entrained particle size and number were obtained for both the influent and effluent; on-line turbidity was measured for the effluent only. The data from these measurements substantiated those obtained by chemical analysis. This test program demonstrated the technical feasibility of the proposed self compensating fuel tank coalescing plate oil/water separator concept for reducing the water pollution during fueling operations. Fuel which was previously discharged with the ballast water can now be retained in the ship's fuel tank and used. (Orr-FIRL)
W75-10474

GUIDELINES FOR LANDFILL OF TOXIC INDUSTRIAL SLUDGES,
New York State Dept. of Environmental Conservation, Albany. Div. of Pure Waters.

N. A. Curry.
Presented at Twenty-eighth Industrial Waste Conference, May 1-3, 1973 Purdue University, W. Lafayette, Indiana, 25 p, 2 graph, 1 append.

Descriptors: *Landfills, *Solid wastes, *Sludge wastes, *Sludge disposal, *Industrial wastes, *Water pollution control, Public health, Toxicity, Sludge, Pollutants, Waste disposal.

Guidelines were given for the use of toxic industrial sludges in landfills. These are intended for use only where reclaiming is not practical and disposition to a landfill is the best remaining method available. The following requirements for adequate landfilling are suggested: (1) detailed knowledge of the sludges, (2) precautions to insure continued insolubility of pollutants, (3) maintenance of surveillance to check efficacy of handling, (4) treatment of leachate if contaminated. Since various sludges become soluble under different and sometimes conflicting conditions, no one universal procedure will suffice. Guidelines for landfilling of toxic industrial sludges require information on composition, conditions for removal to meet non-toxic limits refusal of unacceptable wastes, pretreatment of some wastes, precautions to be taken to maintain insolubility, segregation into safely mixed classes, protection aganist water infiltration, surveillance of results and treatment of leachate if toxic. (Jernigan-Vanderbilt)
W75-10487

NBS ADDS FOREIGN WRINKLE TO STANDARDS WORK,
For primary bibliographic entry see Field 5A.
W75-10490

COPING WITH URBAN RUNOFF IN THE UNITED STATES,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 5D.
W75-10541

THE LOXAHATCHEE - A RIVER IN DISTRESS, SOUTHEAST FLORIDA,
Geological Survey, Miami, Fla.
For primary bibliographic entry see Field 4C.
W75-10588

REPORT ON THE RIVER MASTER OF THE DELAWARE RIVER FOR THE PERIOD DECEMBER 1, 1973-NOVEMBER 30, 1974,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4A.
W75-10589

PROBLEMS RELATED TO WATER QUALITY AND ALGAL CONTROL IN LOPEZ RESERVOIR, SAN LUIS OBISPO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5B.
W75-10601

THE LAWS AND THEIR ENFORCEMENT; PROGRESS AMIDST PROBLEMS,
L. J. White.
Chemical Engineering, Vol 81, No 22, p 7-10, October 21, 1974. 3 tab.

Descriptors: *Federal Water Pollution Control Act, Water pollution control, Effluents, Industrial wastes, Legislation, *Water quality standards, Chemical wastes.
Identifiers: Chemical process industries, Effluent guidelines.

Guidelines set under the 1972 Federal Water Pollution Control Act have been challenged by the chemical industries on three grounds: procedural challenges (that is, which court has jurisdiction); claims of factual mistakes; and arguments against the Environmental Protection Agency's interpretation of the Act. For example, a controversy in interpretation is the use of 'guidelines' and 'limitations'. One viewpoint is that Congress intended the EPA to use general guidelines for effluents to define a range of discharge levels. These figures would then be used to write NPDS permits, which would give limitations for each individual situation. The EPA, however, uses limitations as standards or requirements for a particular industry. Guidelines were issued in 1974 for thirty industries; a standard or regulation, once issued, must be challenged within 90 days or be accepted. The industries, listed in the order for which guidelines were made in 1974 are: fiberglass insulation, beet sugar, feedlots, glass, cement, phosphates, rubber, ferroalloys, asbestos, meat products, inorganic chemicals, cane sugar refining, grain mills, fruits and vegetables, electroplating, plastics and synthetics, nonferrous metals, fertilizers, leather tanning, soaps and detergents, timber products, organic chemicals, petroleum refining, builders paper, dairy, pulp and paper, seafood, iron and steel, textiles, and stream and electric. (Prague-FIRL)
W75-10607

PROGRAM FOR CONTROL OF DISCHARGES OF POLLUTANTS TO NAVIGABLE WATERS.
Federal Register, Vol 39, No 244, p 43759, December 18, 1974.

Descriptors: *Waste discharge, *Federal jurisdiction, *State jurisdiction, *Hawaii, Federal Water Pollution Control Act, Administration, Navigable waters, Permits, *Water quality standards, Water pollution control, Pollution abatement.
Identifiers: Pollutant discharge.

The United States Environmental Protection Agency has granted the State of Hawaii's request for approval of its program for controlling discharges of pollutants to navigable waters in accordance with the National Pollutant Discharge Elimination System (NPDES). This is in accord with section 402(b) of the Federal Water Pollution Control Act, as amended, and provides that a state may administer its own permit program for discharges into navigable waters within its jurisdiction after approval of such a program by a Federal Administrator. On August 30, 1974, Hawaii submitted a program for carrying out the NPDES. On October 10, 1974, EPA conducted a public hearing on the proposed approval of Honolulu, Hawaii. As of November 29, 1974, the Hawaii NPDES permit program was approved, to be administered by the Hawaii State Department of Health. (Prague-FIRL)
W75-10608

WATER QUALITY CRITERIA FOR EUROPEAN FRESH-WATER FISH.
Food and Agriculture Organization of the United Nations, Rome (Italy). European Inland Fisheries Advisory Commission.
For primary bibliographic entry see Field 5C.
W75-10609

WATER QUALITY CRITERIA FOR EUROPEAN FRESHWATER FISH.
Food and Agriculture Organization of the United Nations, Rome (Italy). European Inland Fisheries Advisory Commission.
For primary bibliographic entry see Field 5C.
W75-10610

BIOLOGICAL ACTIVITY OF ORGANOPHOSPHORUS COMPOUNDS AND SYNTHETIC PYRETHROIDS AGAINST IMMATURE MOSQUITOES,
California Univ., Riverside. Dept. of Entomology.
H. A. Darwazeh, and M. S. Mulla.
Mosqito News, Vol 34, No 2, p 151-155, 1974.

Descriptors: Organic compounds, *Phosphorus compounds, Mosquitoes, *Larvicides, Larvae, Mortality, *Insect control, Insecticides.
Identifiers: Anopheles-albimanus, Culex-peus, Culex-pipiens-quinquefasciatus, Culex-tarsalis, Culiseta-inornata, *Pyrethroids(Synthetic), *Organophosphorus compounds, *Mosquito control.

The synthetic pyrethroids NIA-18739 (5-benzyl-3-furyl)methyl(+)-trans-2,2-dimethyl-3-(2-methyl-1-propenyl)cyclopropane-1-carboxylate, NIA-24110 (RU-11679) (5-benzyl-3-furyl)methyl 1R-2-((cyclopentylidene)methyl)-3,3-dimethyl-cyclopropane-carboxylate and NIA-26021 (cis component of SBP-1382) at the rate of 0.01 ppm produced complete mortality of 4th-stage larvae od Aedes aegypti Linnaeus, Anopheles albimanus Wiedemann and Culex pipiens quinquefasciatus Say in the laboratory within an hour after treatment. Organophosphorus larvicides which displayed high biological activity against 4th-stage larvae of these species at the rate of 0.05 ppm or less were Bay SRA-7660, N-2596 (O, ethyl-S-(p-chlorophenyl ethane phosphonodithioate), M-3196 (O,O-dimethyl O-3,5,6-trichloro-2-pyridylphosphorothioate, Cidial (ethyl mercaptophenyl-acetate, O,O-dimethyl phosphorodithioate) and Bay HOX-1619. Larvae and pupae of Culex tarsalis Coquillett, C. peus Speiser and Culiseta inornata Williston in field breeding ponds were controlled by the pyrethroids applied at the rate of 0.25 lb/acre active ingredient. N-2596 and Bay ZUM-0677 gave complete control of larvae in these ponds at the rate of 0.01 and 0.025 lb/acre respectively.--Copyright 1974, Biological Abstracts, Inc.
W75-10631

JETTISONING OF LNG AT SEA--AN UNRESOLVED POLLLUTION HAZARD.
Marine Week, Vol 2, No 5, p 23, January 31, 1975.

Descriptors: *Oil spills, Waste disposal, *Water pollution control, Liquid wastes, Gases, Jetsam, Pollutant abatement.
Identifiers: *Liquified natural gas(LNG), Shipping, Vaporization.

Liquefied natural gas (LNG) may be spilled or jettisoned onto the ocean as a result of collision damage or if there is a need to lighten a LNG carrier, such as a disabled vessel. Another possible source of leakage is if liquefied natural gas is allowed to contact the structural steel of a hull during loading, the cryogenic temperature might lead to an eventual brittle fracture. Tests on LNG spillage have been conducted by the Bureau of Mines, the U.S. Coast Guard and the American Gas Association. Results showed vaporization effects and indicated that the ignition point for an explosion is dependent upon the ratio of propane-to-ethane. A discharge of 10,000 cu m would form a cloud 20 feet deep and a mile wide in less than fifteen minutes. If such a cloud should drift over other vessels, an oil terminal, or a city, while burning, serious danger would exist. Another pollution hazard with LNG is the disposal of the boil-off, especially when the carrier is in the harbor. Arguments in favor of atmospheric venting of LNG insist that the methane content is below the explosive limit and that discharge is heated and its density is lower than that of air. Port authorities argue that no matter how much preheating, if there is an inversion over the port, gas will not rise. Since 1974, the U.S. COast Guard has prohibited LNG venting in port. (Prague-FIRL)
W75-10633

MARINE FLOATING SCREEN.
Water and Waste Treatment, Vol 18, No 2, p 24, February, 1975. 1 fig.

Descriptors: *Oil pollution, *Oil spills, *Water pollution control, Oil-water interfaces, Oily water, Equipment, *Screens, Separation techniques.
Identifiers: *Seabooms, Floating screens.

Five million tons of oil enter the sea annually. The use of floating screens would greatly restrict the escape of this oil. A floating screen called 'Seaboom' is composed of elements each 24 feet long and consisting of a 36 inch high and 1/4 inch thick vinyl plate, which floats on a tube, standing upright in the water and extending 12 inches above the surface. The synthetic resins which comprise the screen are resistant to seawater, ice, heat and loads under stormy conditions. The Seaboom can be used to contain oil spilt through transport and transhipment, oilwell drilling and waste disposal of refineries and industry. The Seaboom is available in floating and submersible versions. The submersile Seaboom has made it possible to seal off harbors and water areas in case of soil hazard in a matter of minutes. (Orr-FIRL)
W75-10634

RECOVERING OIL SPILLS FROM WATER.
Water and Sewage Works, Vol 122, No 4, p 73, April, 1975.

Descriptors: *Oil pollution, *Oil spills, *Water pollution control, Oil-water interfaces, Oily water, *Separation techniques, Water pollution, Equipment, Pollution abatement.

A new oil sweeper ship and oil-water separator system has been introduced by Hydrovac Systems International, Inc. The system has been successfully tested in the port of Rotterdam, the Netherlands. The major function of the system is to collect oil that is lost because of tanker leaks and ship collisions as well as from leakage and accidents at oil terminals and offshore drilling sites. The oil-water mixture is collected by the oil sweeper boom and pumped through hoses to the oil-water tank and the purified water is discharged overboard. The Hydrovac oil-water separator divides oily water automatically into oil and essentially oilfree water. The separation is effected by mechanical methods and requires no chemicals, electronics, or supervision. When used to full capacity, the separator meets the 1973 specifications of the Intergovernmental Maritime Consultative Organization. With a smaller throughput, the separator is capable of meeting the stringent U.S. requirements of an effluent water with less than ten ppm oil. (Orr-FIRL)
W75-10635

800 MILES TO GO,
Alyeska Pipeline Service Co., Bellevue, Wash.
For primary bibliographic entry see Field 5C.
W75-10638

ICEBREAKING DRILLSHIP FOR OFFSHORE EXPLORATORY DRILLING IN THE ARCTIC,
K. M. Jones, and J. C. Schaff.
Journal of Petroleum Technology, Vol 27, No 4, p 433-444, April, 1975. 9 fig, 1 tab, 14 ref.

Descriptors: *Oil, *Drilling, Oil industry, Oil wastes, Environmental effects, *Arctic, Cold regions, Waste disposal, Oil spills, Equipment, Water pollution control.
Identifiers: *Offshore drilling.

Practical techniques and equipment for drilling off-shore oil must be coupled with an application to specific environmental problems. In the Arctic in particular, a technology involving a drillship and icebreaker combination was required. Environmental protection necessitated the establishment of an ecological baseline, considering variations in water temperature, salinity, dissolved oxygen, pH, nutrients, plankton, trace elements, and turbidity. Icebreaking energy regulations were followed and vessel testing was carefully conducted. Primary pollutant sources from the drillship are discharge of oily ballast, bilge pumping, and disposal of personnel's garbage and sewage. Products of bilge pumping and ballast tank discharge are to be run through a coalescer before being pumped overboard. Disposal plants and incinerators are provided on-ship for sewage treatment. Emergency equipment includes oil-absorbent materials and chemical and mechanical containment means for use in the case of accidental oil spillage. (Prague-FIRL)
W75-10639

EFFECTS OF AN OFFSHORE CRUDE OIL UNLOADING TERMINAL ON THE MARINE ENVIRONMENT,
Texas A and M Univ., College Station. Environmental Engineering Div.
For primary bibliographic entry see Field 5C.
W75-10642

PREDICTING THE CONCENTRATION OF AQUATIC HERBICIDE RESIDUES IN WATERWAYS,
Commonwealth Scientific and Industrial Research Organization, Griffith (Australia). Div. of Irrigation Research.
For primary bibliographic entry see Field 5B.
W75-10648

ENVIRONMENTAL PROBLEMS ASSOCIATED WITH THE USE OF COOLING TOWERS,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 5D.
W75-10671

BIOLOGICAL BASES FOR WATER QUALITY STANDARDS,
Rice Univ., Houston, Tex. Dept. of Biology.
For primary bibliographic entry see Field 5G.
W75-10677

BIOLOGICAL BASES FOR WATER QUALITY STANDARDS,
Rice Univ., Houston, Tex. Dept. of Biology.
C. H. Ward, and E. M. Davis.
In: Proceedings of the 27th Industrial Waste Conference, May 2-4, 1972, Purdue University, Lafayette, Indiana, Engineering Extension Series No 141, Part 1, p 438-446. 4 fig, 1 tab, 22 ref.

Descriptors: *Water quality standards, Aquatic life, *Lethal limit, Pollutants, Toxicity, Water pollution effects.

The application of the medium tolerance limit, the median lethal concentration, or any other test of acute toxicity is not conclusive that any pollutant concentration is safe for aquatic life. Much of the data on the toxicities of many compounds and most elements to one or another type of fish are generally available in some form, and are reported as 'threshold concentration' or 'incipient lethal levels,' both meaning 'the level of lethal agent the animals could be expected to tolerate indefinitely'. These levels, then, should be close to the 'safe' concentrations, but they are generally not recognized as such. The authoritative sources most frequently cited as justification for particular water quality standards are the Ohio River Valley Water Sanitation Commission report on Stream-Quality Criteria and Minimum Conditions, Water Quality Criteria by McKee and Wolf, and the National Technical Advisorty Commission report on Water Quality, although none of these reports were intended to be data sources for establishing water quality standards. Standards should be set that fall in the middle range of well-documented toxicity, then the levels appropriate to ensure maintenance of desired water quality should be determined by toxicological testing and the results used to reevaluate the standards previously established. (Auen-Wisconsin)
W75-10677

AUTOMATED SEQUENTIAL COMPOSITE SAMPLING. A NEW TECHNIQUE FOR WATER POLLUTION STUDY AND CONTROL,
N-Con Systems Co., Inc., Larchmont, N.Y.
For primary bibliographic entry see Field 5A.
W75-10690

RIVERS IN THE CITY,
For primary bibliographic entry see Field 6B.
W75-10723

OIL AND DEBRIS REMOVAL UNIT,
P. Condit, Jr.
US Patent No 3,891,558, 4 p, 5 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 935, No 4, p 1652, June 24, 1975.

Descriptors: *Patents, *Oil spills, *Oil pollution, Water pollution treatment, *Water pollution control, *Water quality control, *Separation techniques, Flotsam, Jetsam, Equipment, Conveyance structures, Pollution abatement.
Identifiers: Belt conveyors.

The removal of oil films and flotsam and jetsam from water is accomplished by providing an endless belt conveyor to which the oil is intended to adhere and which is characterized by a plurality of scoops that are attached to the surface of the belt for retrieving and dumping the flotsam and other debris of a solid or quasi solid nature. A particular advantage resides in an endless conveyor which may be pivotly mounted and is therefore adapted to assume multiple angular relationships in which one lower end is intended to be in contact with the water and the other upper end in adjacent relation to receptacle means. The conveyor may be positioned at varying angles so that the receptacle may be at any height above the water. A further advantage is in the provision for adjustable wiper blades intended to clean oil from the undersurface of the belt and for modified wiper blades which may clean the upper surface of the belt even though debris scoops are attached. Adjustable tensions means at one end of the conveyor frame varies the belt tension under different operating conditions. (Sinha-OEIS)
W75-10726

OIL SEPARATION AND RECOVERY DEVICE,
F. Galicia.
US Patent No 3,890,234, 4 p, 9 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 935, No 3, p 1208, June 17, 1975.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Water pollution control, Water pollution treatment, *Separation techniques, Mechanical control, Mechanical equipment, Heating, Pollution abatement.

An oil separation and recovery device is described which may be towed or otherwise propelled over, or left stationary on, the surface of a body of intersect the liquid surface causing the oil polluted water to flow into an inner chamber as the oil rises to the trough vertices. If stationary, high pressure water is used to force the oil polluted water along the troughs to the inner chamber as a vacuum is created. In either case, but particularly the latter, the contaminated water flow path is improved by utilizing depolluted discharging water to induce a surface current of oil polluted water to flow toward the troughs. Also, the utilization of a heating means keeps the oil flowing expeditiously through the troughs. (Sinha-OEIS)
W75-10728

PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON WASTE OIL RECOVERY AND REUSE.
Association of Petroleum Re-Refiners, Washington, D.C.
For primary bibliographic entry see Field 5D.
W75-10739

WASTE OIL MANAGEMENT--THE ENVIRONMENTAL PROTECTION AGENCY'S ROLE,
Environmental Protection Agency, Washington, D.C.
P. B. Lederman, and K. Jakobson.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Inc., Washington, D.C., p 19-27, 1974. 11 ref.

Descriptors: Oil, *Oil wastes, *Oil industry, *Water pollution sources, Waste disposal, Oil pollution, Foreign research, Recycling, Industrial wastes.
Identifiers: Re-refining, France, Germany.

The Environmental Protection Agency has been concerned with waste oil for the past three years. The concern started with reports that these oils were entering water courses. The current EPA program emphasizes resource recovery with environmental control. The two primary sources of waste oil are crankcase oil and industrial oil. Other sources include oil recovered from spills, tank cleanings, and ballast water. EPA has had a multifaceted program in waste oil management. Programs funded include waste oil management studies, development of institutional programs, and evaluation of existing technology and methodology. EPA has funded a major program to develop a non-polluting process for re-refining and recovering waste oils for use as diesel fuel and/or lubricants. A major problem is the disposal of the sludge remainders from re-refining; therefore EPA is sponsoring work to develop acceptable means of disposing the re-refining sludges. The EPA is also sponsoring programs to develop waste oil collection systems and models. The EPA has contracts to obtain data on waste oil generation, waste oil utilization, and the engineering evaluation of current waste oil re-refining processes. French and German methods of dealing with waste oils are also discussed. (See also W75-10739) (Orr-FIRL)
W75-10742

CONTAINMENT, COLLECTION AND RECYCLING OF OILY WASTES,
T. Dalton.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Inc., Washington, D.C., p 91-97, 1974. 1 fig, 1 tab.

Descriptors: *Oily water, *Oil wastes, *Recycling, *Oil spills, *Water pollution sources, Oil pollution, Water pollution, Industrial wastes, Pollution abatement, Waste treatment.
Identifiers: Waste oil recycling.

The basic nature of the problem of containing, collecting and recycling oily wastes is reviewed. Of primary concern is the determination of an oil balance for each specific plant location. A waste oil analysis should be performed. An oil spill contingency program should be devised for those plant situations where emergency spills may occur. Spills are broadly grouped into two categories: land spills and waterborne spills. Ekoperl and Conwed Sorbers are described; these can be used for containing and absorbing spills on land. MP Boom specifications are given; this boom can be used for containing waterborne spills. The waterborne spills, after they have been contained, can be removed by appropriate skimming devices, absorbent materials, or manual skimming. All plants should have the supplies and equipment necessary for combating oil spills readily available in the same way fire equipment is available. If the collected oil is of high quality and expensive, it should be placed in a segregated system and treated either chemically or mechanically for recycling and reuse. If the oil is of poor quality and inexpensive, it can be mixed with fuel oil and removed through the combustion process. (See also W75-10739) (Orr-FIRL)
W75-10747

ENVIRONMENTAL ACTION AT PORT AUTHORITY AIRPORTS,
Port Authority of New York and New Jersey.
A. M. Attar.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Inc., Washington, D.C., p 99-116, 1974. 19 fig, 5 tab.

Descriptors: *Oily water, *Oil wastes, *Pollution abatement, Water pollution sources, *Airports, Oil pollution, Oil spills, Oil, Fuels, Industrial wastes, *Port Authority of New York, New York, New Jersey.

The Port Authority of NY and NJ is conducting a comprehensive program to protect and improve the environment around the airports under its jurisdiction. In 1971, Calspan Corporation of Buffalo was retained by the Port Authority as a consultant on a far-reaching program developed to provide analysis of airport discharges, recommendations for short-term control measures and proposals for long-term preventive solutions. Short-term recommendations are: increase water pollution control unit staff; intensify tenant education programs; increase inspection and surveillance; establish sanctions against deliberate and inexcusable abuse of tenant leases; establish policy of imposing established sanctions; perform oil water separator testing; segregate wash waters from other wastes in hangars; use vacuum pick up scrubbers for ramp washing; test high pressure water systems for runway cleaning; perform experiments to test surface spray disposal of cresylic acid runway washing solutions; encourage reporting of accidental spills. Long-term recommendations include: treatment of all hangar and maintenance facility wastes; centralized deicing facilities with holding tanks for used ethylene glycol-melted ice solutions; derubberizing runways; design and install tide gates at various outfalls; install belt skimmers in sumps; install chlorination systems; install upstream booms to aid in spill tracing; install upstream booming areas for spill cleanup; install French wells where leaks are detected; and, install a centralized monitoring system. (See also W75-10739) (Orr-FIRL)
W75-10748

PORT RECEPTION AND TREATMENT FACILITIES FOR OILY WASTE FROM VESSELS,
Maritime Administration, Washington, D.C.
A. S. Armstrong, and K. J. Randall.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Inc., Washington, D.C., p 149-184, 1974. 2 fig, 10 tab, 12 ref.

Descriptors: *Oily water, *Waste disposal, Ships, *Oil wastes, Water pollution sources, Waste treatment, Governments, Governmental interrelations, Recycling, *Pollution abatement, Harbors, *Treatment facilities, Waste water treatment.

The scope of the oily waste problem is described in terms of quantifying the waste oil volumes which may be expected by U.S. ports. The various methods for removing oily waste from vessels and disposing of the treated water and recovered oil are described. Also discussed is the economic viability of waste oil recovery disposal operations from vessels, and the roles of the various government agencies in preparing for shoreside handling of vessel-generated oily wastes. Conclusions and recommendations are presented in regard to collection/separation entrepreneurial potential and oil processing entrepreneurial potential. The cost associated with collection, treatment, and disposal of oily waste from vessels will eventually lead to an increase in ocean steamship freight rates or required freight rate. The role of the Federal Government should be to facilitate the growth of current oily waste facility and service capabilities to meet the requirements of maritime pollution abatement. The role of state governments is interrelated with Federal grant programs. Local government roles may be investments by communities in the construction and ownership of treatment facilities which are then operated by entrepreneurs. Local governments could also be responsible for the enforcement of bans on certain kinds of waste disposal practices. (See also W75-10739) (Orr-FIRL)
W75-10751

CHARACTERISTICS OF OIL POLLUTION IN AND AROUND U.S. WATERS,
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 5B.
W75-10754

A PROGRAM FOR HANDLING EMERGENCY OIL SPILLAGES IN THE PORT OF BALTIMORE,
Maryland Port Authority, Baltimore.
R. Wilcox.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Inc., Washington, D.C., p 225-235, 1974. 8 fig.

Descriptors: *Oil spills, *Oil pollution, *Water pollution sources, *Oily water, Equipment, Oil-water interfaces, Maryland, Ships, Port authorities, Cleaning.
Identifiers: *Baltimore Harbor(Md), Baltimore(Md), Oil spill clean up.

The Maryland Port Administration has been responsible for the removal of debris and oil from the waters of Baltimore Harbor. A State law passed in 1970 gave it the additonal responsibility of developing a program which would enable the State to respond to an emergency oil spillage in the Baltimore Harbor area. The Maryland Port Administration has assembled an inventory of sophisticated equipment designed to remove oil and debris from the harbor waters with maximum efficiency and effectiveness, and has taken a primary role in encouraging and coordinating the work of governmental agencies and private industry to assist in the minimization of the incidence of spills in the Baltimore Harbor area. In 1962, the PORT SERVICE, a small tank vessel with an oil recovery system, was acquired. In the bow of this vessel is a four-roller, hydraulically powered device which separates and removes oil from the surface of water by the principle of adhesion and cohesion; the oil clinging to the surface of the rotating aluminum drums is wiped off and flows by gravity into the vessel's 3000 gallon cargo tank. The recovered oil is off-loaded via the PORT SERVICE's own cargo discharge system. The PORT RETRIEVER, purchased in 1966, is a self-propelled waterborne front and loader. This boat removes more than one million pounds of debris from the waters of Baltimore Harbor annually. By attaching a hardware cloth insert in the scoop, the PORT RETRIEVER is capable of removing the more viscous oil spills without prior application of any sorbent materials. A water-borne dump truck has also been designed to work in conjunction with the PORT RETRIEVER. (See also W75-10739) (Orr-FIRL)
W75-10755

THE ECONOMICS OF RE-REFINING,
N. J. Weinstein.

In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Inc., Washington, D.C., p 245-260, 1974. 4 fig, 4 tab, 11 ref.

Descriptors: *Oil wastes, *Waste disposal, *Recycling, Economics, Waste treatment, Lubricants, Fuels, Pollution abatement.
Identifiers: *Re-refining, Acid/clay treatment.

The economics of re-refining waste oils and alternative methods of disposing of crankcase waste oils are discussed. Although re-refining cannot readily compete on an economic basis with road oiling or dust control or with the direct use of drain oils as a fuel component, these methods of disposal do not overcome the environmental problems of disposal. Alternatives to the above methods are: re-refining to produce lubricating oil blending stocks; processing to produce clean fuel oil; controlled combustion to produce steam; and, use as a fuel where adequate particulate control systems exist or can be economically installed. Costs are presented for the following re-refining processes: acid/clay treatment; propane extraction/acid/clay treatment; distillation/clay treatment; and, distillation/hydrotreating. Vacuum distillation and recovery of fuel products, leaving a bottoms fraction containing solid residues and burning of raw crankcase oil under carefully controlled conditions to recover energy in the form of steam are also examined. Acid/clay treatment is a marginal process for producing lube oil; alternative processes are available which are more attractive. Only the distillation/hydrotreating process apperas to be an economically attractive process producing no waste products. Distillation to produce clean fuels does not seem attrative in comparison to lube oil production. Controlled combustion with steam recovery can be attrative where a steam market exists. Refining of crankcase waste oils to produce lube oil stocks can be economically feasible and desirable way to recycle up to about 500 million gallons of this waste oil. (See also W75-10739) (Orr-FIRL)
W75-10757

OIL CONTAMINATED WATER RECYCLING SYSTEM,
For primary bibliographic entry see Field 5D.
W75-10760

THE WASTE OIL INDUSTRY: A DISCUSSION OF SOME ISSUES TO CONSIDER IN PERFORMING AN ECONOMIC ANALYSIS,
Environmental Protection Agency, Washington, D.C.
J. A. Jaksch.
In: Proceedings of the International Conference on Waste Oil Recovery and Reuse, February 12-14, 1974, Washington, D.C., Information Transfer, Incorporated, Washington, D.C., p 395-404, 1974. 1 tab, 5 ref.

Descriptors: *Oil wastes, *Waste disposal, Industrial wastes, Federal jurisdiction, Legislation, *Oil industry.
Identifiers: Re-refining, Waste oil industry.

A brief overview is given of some of the issues an economist should consider in undertaking an analysis of the waste oil industry. Waste oil disposal, waste oil collection, waste oil re-refining, and combined industry analysis are considered. Two broad categories of waste oils are industrial and automotive. The first is easier to recover because waste concentration is at the place of use. Of the one billion gallons of waste oil produced annually, an estimated 100 million gallons are re-refined or reprocessed; 200 million gallons are used as road oil, some burned as fuel oil, and about 750 million gallons disposed of with no specific assurances of preventing groundwater or surface water pollution. Cost-revenue comparisons of production of virgin lube oils as opposed to re-refining waste oils are being delineated. Federal Trade Commission and Internal Revenue Service requirements have contributed to a decline in re-refining. Decision making involves an analysis of economic implications and impacts of policy options. Such options for cost-effective and environmentally effective decisions include: paying subsidies to recover waste oil; changing current tax laws which encourage use of virgin oil over recovered oil (such as depletion allowances); or specification of federal oil waste recovery policies. (See also W75-10739) (Prague-FIRL)
W75-10767

AGRICULTURAL AND URBAN CONSIDERATIONS IN IRRIGATION AND DRAINAGE.
American Society of Civil Engineers, New York.
For primary bibliographic entry see Field 4A.
W75-10769

THE PERIMETER CANAL - A NEW APPROACH TO DISCHARGE URBAN WATER INTO A COASTAL MANGROVE AREA,
Greiner (J.E.) Co., Inc., Tampa, Fla.
For primary bibliographic entry see Field 4A.
W75-10773

WELLTON-MOHAWK DRAINAGE AND THE MEXICAN SALT PROBLEM,
Wellton-Mohawk Irrigation and Drainage District, Ariz.
For primary bibliographic entry see Field 4A.
W75-10783

ENVIRONMENTAL ISSUES, EFFECTS, AND SOLUTIONS,
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 6G.
W75-10795

EVALUATION OF AGRICULTURAL DRAINAGE IN WATER QUALITY MANAGEMENT,
Water Resources Engineers, Inc., Walnut Creek, Calif.
T. C. Lyons, D. P. Russell, and R. G. Fry.
In: Agricultural and Urban Considerations In Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 529-555, 1974. 2 fig, 8 tab, 18 ref.

Descriptors: *Water quality, *Agricultural runoff, *Agricultural chemicals, *Model studies, *California, Fertilizers, Nutrients, Simulation analysis, Drainage water, Wastes, Pollutants, Soils, Irrigation, Crops, Agriculture, Land use, Mathematical models.

Changing priorities and patterns of land and water uses have given rise to new drainage and groundwater quality problems; consequently, engineers and systems analysts have developed new analytical techniques in response to these time-varying problems. One of the more promising of these techniques is mathematical simulation modeling on high speed digital and hybrid computers. The development of these techniques, however, has pushed data input requirements beyond the state-of-the-art of the traditional methods of evaluating the environmental effects of agricultural practices. Water-quality constituents returned to groundwater basins from irrigated agriculture constitute one of these illusive data sets. A procedure has been developed and used on three entire river basins in California for handling and evaluating changing land use patterns, including agricultural cropping patterns and cultural practices, and for determining the quantity of water and quality constituents contained in irrigation drainage. Discussed were the systems analysis conceptual representation of changing land and water use patterns, the procedures developed for generating the necessary agricultural drainage water quality systems input data, and the data management techniques necessary to handle the time and space-varying input data system developed. (See also W75-10769) (Sims-ISWS)
W75-10796

IRRIGATION MANAGEMENT FOR SALT CONTROL,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
For primary bibliographic entry see Field 3C.
W75-10800

EFFECTS OF FARMING - URBAN DRAINAGE ON FRESH WATER,
Orange County Pollution Control Dept., Orlando, Fla.
C. W. Sheffield, and W. M. Bishop.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 691-709, 1974. 6 ref.

Descriptors: *Drainage practices, *Urban drainage, *Agricultural runoff, *Water pollution control, *Florida, Nutrients, Eutrophication, Lakes, Freshwater, Surface runoff, Surface waters, Water pollution effects, Storm runoff, Agricultural watersheds, Agriculture, Farm wastes, Drainage engineering.
Identifiers: *Lake Apopka(Fla).

The discharge from the 9000 acre organic soil vegetable farms on the north shore of Lake Apopka have contributed to the nutrification of this lake. The net nutriet load from these farms is approximately 2400 lbs/day total inorganic nitrogen-N. Water quality sampling in 1970 indicated that the total PO4 in the northern portion of the lake was, on an average, 0.12 mg/L higher than the southern shore. Similarly, there was 0.21 mg/L more total nitrogen. The continual supply of nutrients into the lake, not only from the agricultural interests but all sources, has caused the accelerated eutrophication of this lake to the extent that it is currently not beneficial for anyone's use. The pollution effects of storm water drainage were reviewed with regard to concentration and possible means to reduce the amount of pollution entering receiving waters. Present and proposed practices for reducing the pollution load into Lake Apopka were discussed. (See also W75-10769) (Sims-ISWS)
W75-10802

PROBLEMS OF WATER QUALITY MANAGEMENT IN WESTERN RIVER BASIN SYSTEMS,
California Univ., Los Angeles. Coll. of Engineering.
A. F. Pillsbury.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 729-751, 1974. 25 ref.

Descriptors: *Water quality, *Salinity, *Rivers, *Ecosystems, *United States, Irrigation, Soils, Drainage, Salts, Pollutants, Farm wastes, Imported water, Water sources, Salt balance, Tile drainage, Food chains, Fish food organisms, Algae, Nuclear powerplants, Cooling water, Political aspects, Social aspects, Agriculture, Flow augmentation.
Identifiers: *Western United States.

Today's ecology movement, which is halting water development in the western states, is the key to the future destruction of our civilization. Only water development has made it possible for the

west to bloom. Without continued development, deterioration will set in. If the quality of the environment is to be preserved for many generations to follow, the total environmental system - physical, social, and economic - must be considered together as a system. The principles that must be adhered to to optimize that total environment were discussed. The salinity problems of the rivers in the western United States were emphasized, and solutions were proposed. It was concluded that technology has the solution to problems of water quality management, or can develop the solutions needed. Those solutions must involve augmentation and the export of salts to the ocean or other sink to achieve salt balance. (See also W75-10769) (Sims-ISWS)
W75-10804

EFFECT OF AGRICULTURAL USE ON WATER QUALITY FOR DOWNSTREAM USE FOR IRRIGATION,
Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering.
J. E. Christiansen.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 753-785, 1974. 11 tab, 28 ref, 1 append.

Descriptors: *Irrigation, *Water quality, *Drainage, *Salinity, *Rio Grande River, *Colorado River, Salts, Salt balance, Irrigation effects, Irrigation practices, Classification, Leaching, Irrigation efficiency, Mineralogy, Soils, Rivers, Agriculture, Downstream.
Identifiers: *Imperial Valley(Cal), *Sevier River(Utah).

An historical review of various proposals for classifying irrigation waters was presented. Limitations of some of the more commonly used criteria were mentioned. Salt balance and the need for a favorable salt balance in an irrigated area was explained. Leaching requirement was included in the discussion because of its relationship to the management of irrigation water. A study of the composition of irrigation water along several stream systems in relation to various criteria for classifying water was presented for the Rio Grande, the Sevier River in Utah, the Upper Basin of the Colorado River in Utah, and the Imperial Irrigation District. The discussion was limited to downstream uses for irrigation. Some conclusions were: (1) the development of irrigation projects along any river system where return flow enters the river results in some deterioration in the quality of downstream flow; (2) more efficient management of irrigation water should, at least temporarily, provide some improvement in the downstream water quality and possibly increase the downstream flow; and (3) from the long-term point of view, however, relatively little can be done in the way of more efficient management of the water resources on developed projects to improve the downstream water quality. (See also W75-10769) (Sims-ISWS)
W75-10805

METHODOLOG'CAL APPLICATION OF THE STRAW MAN DECISION STRUCTURE TO A HYPOTHETICAL CASE: THE DORFMAN-JACOBY WATER QUALITY MODEL,
California Univ., Riverside.
For primary bibliographic entry see Field 6A.
W75-10811

SOCIAL INDICATORS AND CONNECTIVES,
California Univ., Riverside.
For primary bibliographic entry see Field 6A.
W75-10812

METHODOLOGICAL PROBLEMS IN APPLYING THE STRAW MAN TO REAL LIFE PROBLEMS,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 6A.
W75-10814

EFFLUENT TREATMENT EQUIPMENT.
For primary bibliographic entry see Field 5D.
W75-10832

AMENDMENTS TO THE WATER ACT,
B. O'Brien.
Mining Congress Journal, Vol 60, No 8, p 54-55, August, 1974.

Descriptors: *Toxicity, *Water pollution, Water law, Federal government, Regulation, Standards, Control.
Identifiers: The Water Act.

The Environmental Protection Agency has recommended to Congress that ammendments to the Water Act be made. An extension to three years for compliance with the toxic water pollution limitations will be requested. It is expected that the EPA will also ask for a transformation of the present formal hearings on proposed toxic regulations into informal proceedings. Russell Train, EPA Administrator, states that his organization is considering asking for authority to grant exemptions from the toxic limitations for a plant which is unable to meet the requirements due to no available technology for the treatment of the particular waste. The amendments should be submitted by the EPA to Congress in January of 1975. (Leibowitz-FIRL)
W75-10835

WATER QUALITY FACTORS IN DESIGNING A SEWAGE PLANT BASED ON PUBLIC DRAINAGE STATISTICAL DATA, (IN JAPANESE),
For primary bibliographic entry see Field 5D.
W75-10838

THE CONSEQUENCES OF ACCEPTING INDUSTRIAL WASTES INTO SEWERS; WATER POLLUTION RESEARCH AT STEVENAGE,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 5D.
W75-10842

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

ANALYSIS OF A LARGE WATER DISTRIBUTION SYSTEM USING ADVANCED COMPUTER SOFTWARE,
Orlando Utilities Commission, Fla.
For primary bibliographic entry see Field 4A.
W75-10720

GROUNDWATER MODEL AS A TOOL IN PLANNING AND MANAGEMENT,
CH2M/Hill, Portland, Oreg.
For primary bibliographic entry see Field 4B.
W75-10781

EVALUATION OF AGRICULTURAL DRAINAGE IN WATER QUALITY MANAGEMENT,
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 5G.
W75-10796

PANEL REVIEW OF THE TAXONOMIC STRUCTURE OF THE STRAW MAN.
California Univ., Riverside. Program in Environmental Economics.
For primary bibliographic entry see Field 6B.
W75-10806

PANEL EVALUATION OF THE LOGICAL STRUCTURE, CONSISTENCY, AND UNDERLYING ASSUMPTIONS OF THE 'STRAWMAN' METHODOLOGY.
California Univ., Riverside. Technical Committee of the Water Resources Centers of the Thirteen Western States.
For primary bibliographic entry see Field 6B.
W75-10807

COMMENTS ON THE STRAW MAN,
California Univ., Riverside. Dept. of Philosophy.
For primary bibliographic entry see Field 6B.
W75-10808

REPORT TO THE TECHNICAL COMMITTEE OF THE WATER RESOURCES CENTERS OF THE THIRTEEN WESTERN STATES,
Princeton Univ., N.J. Dept. of Philosophy.
For primary bibliographic entry see Field 6B.
W75-10809

PROCEEDINGS OF THE GRADUATE STUDENT SYMPOSIUM OF THE TECHNICAL COMMITTEE OF THE WATER RESOURCES CENTERS OF THE THIRTEEN WESTERN STATES.
California Univ., Riverside. Program in Environmental Economics.
Available from the National Technical Information Service, Springfield, Va 22191 as PB-244 839, $7.00 in paper copy, $2.25 in microfiche. Project No. DACW31-72-C-0060, Planning and Evaluation for the Straw Man Research Project, Report PRWG-120-1, September 1972. 187 p, 25 fig, 8 tab, 31 ref. OWRT C-3377(3721)(3).

Descriptors: *Water resources development, *Social aspects, *Planning, *Methodology, *Evaluation, Water policy, Computers, Simulation analysis, Water pollution control, Decision making, Effects, Economics, Environment, Data collections, Equations, Assessment, Algorithms, Mathematical models, Systems analysis, Model studies.
Identifiers: *Straw Man model, Social indicators, Action variables, Connectives, Disaggregation, Economic opportunity, Recreational opportunity.

The Technical Committee of the Water Resources Research Centers of the Thirteen Western States initiated a study to develop a water resources planning methodology which would include the assessment or prediction of social achievement resulting from investment in water resource development and use. Achievements are expressed in terms of progress toward implicit and explicit national goals. Developed has been the Straw Man model, a hierarchical array of nine broad goals disaggregated into layers of subgoals which are eventually linked to water policy action variables through social indicators. This report consists of papers resulting from the work done in Phase II of the study. Since Phase I identified and defined explicit national and regional goals and searched for connectives between these goals and water-related activities, Phase II opted to specify and quantize these connectives and analyze other important resource constraints to achieve consistency in the model framework. The overall objective was to narrow the gap between the definition of national goals and the implementation of action programs to achieve such goals. The papers herein include a broad range of topics: application of the Straw Man to the Dorfman-Jacoby model; problems of methodology in applying the Straw Man; application of the methodology to planning;

social indicators and connectives; application of algorithmic modeling to the Straw Man methodology; developing a significant information system; sharpening the definition of action variables; and questions and discussions relating to weighting and distribution. (See W75-10811 through W75-10820) (Bell-Cornell)
W75-10810

METHODOLOGICAL APPLICATION OF THE STRAW MAN DECISION STRUCTURE TO A HYPOTHETICAL CASE: THE DORFMAN-JACOBY WATER QUALITY MODEL,
California Univ., Riverside.
S. Follmer, T. Munnecke, and R. C. d'Arge.
In: Proceedings of the Graduate Student Symposium of the Technical Committee of the Water Resources Centers of the Thirteen Western States, p 11-54, September 1972. 13 fig, 3 append.

Descriptors: *Water resources development, *Social aspects, *Water pollution control, Algorithms, Decision making, Water policy, Political aspects, Alternative planning, Simulation analysis, Biochemical oxygen demand, Dissolved oxygen, Cost-benefit analysis, Waste treatment, Mathematical models, Equations, Systems analysis, Evaluation.
Identifiers: *Straw man, *Social goals, *Social indicators, Disaggregation, General welfare, Streeter-Phelps model, Multi-objective, Economic opportunity, Disaggregation.

Little has been done to elucidate the important links between water resources development and the achievment of regional and national social aspirations. The Straw Man planning methodology, however, attempts to describe regional and national goals and to identify their relation to water resources. It disaggregates the over-arching goal of general welfare into nine general goals (e.g., economic opportunity) which are successively described by expanding strata of subgoals. Each subgoal (e.g., employment opportunity) is linked to water policy action variables by means of its social indicator (e.g., employment percentages). The array is intended as a predictive model or information system, after quantitative connnectives between water policy action variables and social indicators are established and qualitative connectives between social indicators and goals are derived. A preliminary transformation of the Dorfman-Jacoby water supply and quality model into the Straw Man format is achieved. The Dorfman-Jacoby model is a political decision making benefit-cost approach. Herein, the political variability of the model is sacrificed, while the single most realistic weighting scheme is retained. Use of the Dorfman-Jacoby model in Straw Man format more clearly demonstrates the role water resources play in the attainment of social objectives, elucidating the connectives between different water development alternatives and community goals satisfaction. (See also W75-10810) (Bell-Cornell)
W75-10811

SOCIAL INDICATORS AND CONNECTIVES,
California Univ., Riverside.
R. Lando.
In: Proceedings of the Graduate Student Symposium of the Technical Committee of the Water Resources Centers of the Thirteen Western States, p 55-64, September 1972. 4 ref, 1 append.

Descriptors: *Water resources development, *Methodology, *Planning, *Water quality control, *Social aspects, Rivers, Dissolved oxygen, Gross national product, Export, Income, Least squares method, Regional analysis, Colorado River, Costs, Benefits, Water utilization, Mathematical models, Equations, Systems analysis, Evaluation.
Identifiers: Social indicators, Connectives, *Straw Man, National goals, Linear regression, Economic opportunity, Environmental quality, Disaggregation.

The nature of social indicators is examined, their use in the framework of the Straw Man methodology is discussed, and the dangers inherent in their interpretation are described. A social indicator is defined as 'a measure of any phenomenon that is socially significant,' such as employment percentages. It can be a scalar, vector, or a matrix, depending on the variables used in its construction. In the case of river pollution control, the social indicators expressing DO should be time and location specific. Social indicators used by various government agencies occasionally are less than representative of the information they are meant to portray. Ambiguity in interpretation is another problem inherent in the deciphering of social indicators. The social indicator is the most important link in the Straw Man system, allowing both flexibility and precision in measurement. In the collection of social indicators from existing research for use in the Straw Man model, their position in the disaggregation framework and their potential model use should be identified. The appendix includes examples of the collection format being used at UCR and Utah State. Considered are: regional export income as a social indicator; connective between gross national product and regional export income; connective between TDS and gross regional income in the lower Colorado River Basin; and the benefits of water quality enhancement. Connectives should be identified as to form, e.g., linear regression. (See also W75-10810) (Bell-Cornell)
W75-10812

TOWARDS A SHARPER CONCEPT OF AN ACTION VARIABLE,
Colorado State Univ., Fort Collins.
J. T. Davenport, and H. P. Caulfield, Jr.
In: Proceedings of the Graduate Student Symposium of the Technical Committee of the Water Resources Centers of the Thirteen Western States, p 65-84, September 1972. 3 fig, 1 tab, 7 ref, 1 append.

Descriptors: *Water resources development, *Methodology, *Planning, *Projects, *Water law, Federal jurisdiction, Flood control, Water quality control, Federal government, Multiple-purpose, Irrigation, Water policy, Social aspects, Economics, Graphical analysis, Recreation, Systems analysis.
Identifiers: *Straw Man, Action variables, Connectives, Social indicators, Public sector, Private sector, Environmental agencies.

Four key concepts are central to the Straw Man methodology: action variables, social indicators, subgoals and goals, and connectives. A more concise definition of an action variable is presented in the context of federal water law. The two central elements to an action variable are: (1) who is acting (actor), and (2) what general field of water resources development activity they are engaged in (action program). The actor can be a federal agency, a non-federal agency or private interests. Action programs can be irrigation, flood control, water quality enhancement, etc. The study of federal actors and their activities indicates that an action variable may be characterized by four components: (1) specific action of the actor, e.g., advise, design, operate, etc.; (2) legal constraints, e.g., the excess land provisions of the 1902 Reclamation Act; (3) alternative and supplementary action sets of other actors within the action program; and (4) other action programs possibly related to the primary action program, in light of multipurpose projects. Connectives between action variables and social indicators are best defined by studying the effects of employing action variables. An example is given wherein three graphs display a before-and-after effect on flood damage (expressed in dollars) of three different types of flood control measures. An appendix is included of several examples of federal and non-federal (public and private) action variables outlined in detail; considered are flood control, irrigated agriculture, outdoor recreation enhancement, and water quality enhancement. (See also W75-10810) (Bell-Cornell)
W75-10813

METHODOLOGICAL PROBLEMS N APPLYING THE STRAW MAN TO REAL LIFE PROBLEMS,
Arizona Univ., Tucson.
R. M. Judge, F. H. Dove, and W. L. Everett.
In: Proceedings of the Graduate Student Symposium of the Technical Committee of the Water Resources Centers of the Thirteen Western States, p 85-103, September 1972. 1 fig, 2 ref, 1 append.

Descriptors: *Water resources development, *Methodology, *Planning, *Water pollution control, *Social aspects, Population growth, Environment, Shellfish, Industries, Management, Solid wastes, *Arizona, Projects, Systems analysis.
Identifiers: *Straw Man, Social indicators, Connectives, Environmental security, Individual security, Collective security, Disaggregation, Long Island.

Application of the Straw Man methodology to Pima County, Arizona and Suffolk County, New York water and solid waste management plans has revealed problems in definition, classification, and data collection for the Straw Man. Data collection requires much research to establish and describe the relationships between variables, many of them in the biological sphere. The data problem appears in two forms: the collection of information from primary, secondary or other sources and the definition of relationships between input variables and effects. Most problems occur in the physical-economic sphere where a physical impact, e.g., pollution, is to be related to an economic effect. An example concerns the effects of pollution on the shellfish industry of Long Island. Another problem of the Straw Man is one of editing. Study objectives include identifying those social indicators that are appropriate to the Straw Man in general and delineating a subset of these as appropriate to the two-county study. Considered are environmental, individual, and collective security. The two different demographic areas, drawing from groundwater supplies under different geological formations and historical management philosophies, have been studied in detail to estimate connectives between population increases, water and waste management actions and the social indicator set. Included is an appendix which gives a revision of the disaggregation of security goals. (See also W75-10810) (Bell-Cornell)
W75-10814

QUALITATIVE SIGN MATRIX MANIPULATION,
California Univ., Riverside.
T. Munnecke.
In: Proceedings of the Graduate Student Symposium of the Technical Committee of the Water Resources Centers of the Thirteen Western States, p 104-118, September 1972. 5 tab, 1 append.

Descriptors: *Water resources development, *Planning, *Evaluation, Decision making, Conferences, Computers, Social aspects, Equations, Mathematical models, Systems analysis.
Identifiers: *Straw Man, *Algebra of signs, Analysis of consistency, Qualitative information, Delphi method.

Presented are some possible mechanisms which may be used to integrate qualitative information into the Straw Man planning process. Qualitative specification of interactions within the Straw Man is a fairly tractable method of registering first order effects; however, the method fails when one tries to apply standard linear algebraic techniques. Social indicator and action variable connectives are qualitative values and may be handled using conventional linear algebra. Described is an algebra of sign matrices which will allow similar manipulations in the qualitative realm. The algebra

defined and properties described must be considered to be 'building blocks' of a system larger in scope. The most direct outcome of the algebra of signs is the identification of conflicting signs, from which other decision making methods may take over. The Delphi method is briefly described as a possible method to be interfaced to the problem. The literature describing this method seems to be a good base from which to begin further study. The appendix on an analysis of consistency presents a method which may be used to point out inconsistent decisions on the part of a planner. Also, it presents some theoretical concepts by which new information may be extrapolated from old. (See also W75-10810) (Bell-Cornell)
W75-10815

NECESSARY ADAPTATIONS FOR SIGNIFICANT UTILIZATION OF THE INFORMATION SYSTEM,
Colorado State Univ., Fort Collins.
K. Takeuchi.
In: Proceedings of the Graduate Student Symposium of the Technical Committee of the Water Resources Centers of the Thirteen Western States, p 119-127, September 1972. 1 fig, 1 ref.

Descriptors: *Planning, *Methodology, *Assessment, Decision making, Alternative planning, Computers, Operations, Research, River basins, Regions, Water policy, Water resources development.
Identifiers: *Straw Man, *Information systems, Disaggregation, Action variables, Connectives.

Although the structure of the Straw Man methodology has been conceptualized in detail, the utilization of it has not been conceived very adequately. The difficulties expected in operating the system in the real planning process are discussed; the planning information system is assessed as a planning methodology. Two shortcomings of the system are low information content and no analytical capability; the former is inevitable by nature and the latter can be improved technically. The current information system is not helpful in the real planning process. Two major research directions to pursue are suggested: (1) make the system capable of producing information for any action alternatives of interest, and (2) create an action alternative generating system. In order to develop a consequence generating system and alternative generating system, further classification and disaggregation of action variables into a small number of basic components and the determination of connective rules between and/or among components are of primary necessity. (See also W75-10810) (Bell-Cornell)
W75-10816

A METHOD OF DISAGGREGATION,
Nevada Univ., Reno.
W. Jenkins.
In: Proceedings of the Graduate Student Symposium of the Technical Committee of the Water Resources Centers of the Thirteen Western States, p 128-141, September 1972. 1 tab, 4 ref.

Descriptors: *Water resources development, *Planning, *Methodology, *Evaluation, *Social aspects, Effects, Systems analysis.
Identifiers: *Straw Man, *Disaggregation, Interrogatives, Goals, Subgoals, Objectives, Aesthetic opportunity, Social indicators, Connectives.

A hierarchy of goals is a necessary part of an evaluation methodology for water resources planning and social goals which attempts to make proper connections between natural resource development and the nation's multitude of goals and objectives. Two basic conditions are required for the successful implementation of the goal hierarchy within a methodology such as the Straw Man: the goals and objectives must be accurately identified, and they must be represented adequately in an organized manner so that connectives may be made between goals and social indicators and between the goals themselves. It is felt that the second condition for implementation has not been satisfied in the Straw Man. Reviewed are some properties which should be included in the Straw Man and the reasons they are necessary to successful implementation of the goal hierarchy. A method of disaggregation is proposed as an aid to restructuring the Straw Man, and an example of application of this method to reconstruct the goal of aesthetic opportunity is presented. Considered in the example are highly- and little-developed areas, wilderness preserves, and recreational areas. The method of interrogatives used to disaggregate the goal into one level of subgoals is to ask a question designed to reveal pertinent information about the goal, so as to derive an answer which directly yields the subgoals of the disaggregation. Ultimately, the general goals can be successively described by expanding strata of subgoals which are eventually linked to potential water policy variables through social indicators. (See also W75-10810) (Bell-Cornell)
W75-10817

EGALITARIANISM,
Washington Univ., Seattle.
G. Jewett.
In: Proceedings of the Graduate Student Symposium of the Technical Committee of the Water Resources Centers of the Thirteen Western States, p 142-151, September 1972. 7 ref.

Descriptors: *Water resources, Economics, Education, Political aspects, Social aspects, Planning, Methodology, Regional analysis, Costs, Benefits, Environment, Natural resources, Systems analysis.
Identifiers: *Egalitarianism, Straw Man, Social justice, Equal distribution, Delphi method, National equality, Regional equality, Equal distribution, Diversity, Natural/social system.

Presented is a brief review of literature on egalitarianism. Highlighted are the conflict between the two fundamental American values of equality and achievement, and unfulfilled expectation that equality of results would follow from equality of opportunity, and distributive justice. It is suggested that we perhaps conceive of distributive justice in terms of equality -- egalitarian distribution of the good things in life. Indicators for economic, educational, and political equality are suggested. Questioned is how assessment of regional or national equality should be made in terms of equal distribution of costs and benefits, environmental trade-offs to natural systems, and natural systems in interaction with man/social systems. Recommendations are made concerning egalitarianism and the Straw Man. Considered are diversity/control interfaces: can equality and diversity co-exist within the same natural/social system. The Committee should investigate the possibilities and merits available to them in using a Delphi policy consensus methodology. (See also W75-10810) (Bell-Cornell)
W75-10818

A CONNECTIVES MODEL RELATING WATER POLICY ACTION VARIABLES TO RECREATIONAL OPPORTUNITY SOCIAL INDICATORS,
Utah State Univ., Logan.
R. Fletcher.
In: Proceedings of the Graduate Student Symposium of the Technical Committee of the Water Resources Centers of the Thirteen Western States, p 152-169, September 1972. 7 fig, 1 tab.

Descriptors: *Water resources, *Recreation, *Supply, Model studies, Analytical technique, Demand, *Water policy, Measurement, Swimming, Data collections, Economics, Evaluation, Alternative planning, Systems analysis, Computer models, Methodology.
Identifiers: Recreation opportunity, Social indicators, Connectives, Tradeoff coefficient matrix, Compatibility matrix, Physical aspects, Biological aspects.

Due to population growth and the interest in the environment, demands on the water resource base from all sectors have led to the need for redefining national goals and priorities concerning this resource. This study considers the interaction between the recreation sector and its water resource base. A supply model is proposed for answering the question, 'What kinds of, amounts of, and tradeoffs between recreational activities are possible, given a condition of water quality, quantity, and distribution, and the nature of adjacent land and vegetation.' In developing the model, recreational activities are defined in terms of their general characteristics and/or limitations and then further rated by a set of physical and biological parameters which disqualifies or qualifies them as good, fair, or poor activities. The model has 52 parameters relevant to the qualification of eleven activities. Then this activity 'kinds' model becomes an 'amounts' model, determining, in terms of the amount of user units per day, in what quantity the qualified activities can be performed. Two subsequent models consider the interactions and tradeoffs between activities: (1) a tradeoff coefficient matrix, and (2) a compatibility matrix. These matrices provide formulae from which a comprehensive set of feasible alternatives may be developed; supply costs, demand, and socio-economic inputs may be considered. (See also W75-10810) (Bell-Cornell)
W75-10819

ALGORITHMIC MODELING AND THE STRAW MAN,
Utah State Univ., Logan.
M. McKee.
In: Proceedings of the Graduate Student Symposium of the Technical Committee of the Water Resources Centers of the Thirteen Western States, p 170-185, September 1972. 6 ref.

Descriptors: *Water resources development, *Planning, *Simulation analysis, *Methodology, Computer models, Decision making, Water policy, Evaluation, Social aspects, Comprehensive planning, Alternative planning, Long-term planning.
Identifiers: *Straw Man, Linkage modeling, Resiliency, System behavior, Sensitivity analysis, Boundary conditions, Prediction.

Failures in planning and decision making processes occur sometimes from not understanding the behavior of particular systems. A resources planning methodology, especially one as comprehensive as the Straw Man, cannot rely solely on the traditional means of data collection and synthesis. Two important considerations, usually ignored are discussed: (1) problems and implications of integrating the concept of resiliency into such planning methodology; and (2) the need to assume a position of relative ignorance as to long-range and indirect consequences when planning resources usage. Resiliency refers to the stability or absorptive ability of a system. Examples of low-cost housing and pest control policies are given where the implicit assumption of infinite system resiliency resulted in exceedence of the system's resiliency and ultimate collapse of the system. Ignorance refers to accepting the uncertainties in policy implementation; the above policies failed because decisions were based on information assumed as being complete but found later to have been incomplete and/or inaccurate. Considered, therefore, is a method of systems simulation potentially useful in predicting and understanding complex physical/biological/social system behavior, especially regarding boundary conditions, affected by water resources development. An algorithmic method, developed at Utah State University for studying desert ecosystems, is being utilized in conjunction with the Straw Man

planning methodology. (See also W75-10810) (Bell-Cornell)
W75-10820

OPTIMAL SIZING OF URBAN FLOOD-CONTROL SYSTEMS,
Hydrologic Engineering Center, Davis Calif. Planning Analysis Branch.
For primary bibliographic entry see Field 4A.
W75-10821

COMPUTER SIMULATION OF WATER DISTRIBUTION NETWORKS,
Boeing Computer Services, Inc., Seattle, Wash. Mathematicals and Modeling Unit.
For primary bibliographic entry see Field 4A.
W75-10823

6B. Evaluation Process

ANALYZING REIMBURSEMENT MECHANISMS FOR RESOURCE DEVELOPMENT PROJECTS,
Wyoming Univ., Laramie. Div. of Agricultural Economics.
For primary bibliographic entry see Field 6C.
W75-10353

THEORETICAL AND APPLIED CONCEPTS OF WATER RESOURCES FOR SOCIAL WELFARE.
Auburn Univ., Alabama. Dept. of Economics.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-243 940, $4.25 in paper copy, $2.25 in microfiche. School of Business Research Series 4, November 1973. 72 p, 7 fig, 22 tab, 14 ref. OWRT B-037-ALA(1).

Descriptors: *Welfare(Economics), *Water resources, *Standards, *Evaluation, *Value engineering, Industrial production, Industrial water, Water pollution effects, Economic impact, Water quality control, Foreign trade, Tariff, Planning, Social impact, Regional analysis, Commercial fishing, Income analysis, *Alabama, Cost analysis, Recreation, Pollution taxes(Charges), Income, Water demand, National income, Diseconomies of scale, Discount rates, Economic efficiency, U.S. Water Resources Council.
Identifiers: *Externalities, Opprtunity cost, *Industrial interdependencies, *Social equilibrium, *Exchange rates, Transboundary spillovers, Recreation industry, *Pickwick Lake(Ala), 'Principles and Standards' (1973).

A discussion and interpretation of the Water Resources Council's (WRC) new principles and standards is followed by one empirical and two theoretical economic analyses of water resources. The results of the empirical work, which center around the economic effects of closing the commercial fishery in Pickwick Lake, Alabama due to mercury contamination, are appraised in terms of the two objectives and four accounts of the WRC Standards. Effects of the fishing ban on fishermen and on recreation related businesses are assessed using opportunity cost and relative retail sales figures comparison analyses, respectively. The third work approaches the question of whether businessmen who compete in international markets and whose production costs are increased by pollution control laws should be protected from competition from polluting, lower cost producers. Pros and cons of tariffs and adjustable exchange rates between countries as means for protecting businessmen are presented. The final paper is a theoretical treatment of industrial interdependencies and the chain effects of water pollution. The concept of esternal effects in water-using firms is explained using input-output analysis. The effects of water pollution on water-using, non-water-using and public sectors are discussed in terms of several theoretical examples. (See W75-10355 thru W75-10358) (Becker-Wisconsin)
W75-10354

PRINCIPLES AND STANDARDS FOR WATER PLANNING,
Auburn Univ., Alabama. Dept. of Economics.
D. R. Street.
School of Business Research Series 4, November 1973, p5-7.

Descriptors: *Standards, *Welfare(Economics), *Planning, *Environment, *Regional development, Water resource development, Gross National Product, Discount rates, Economic efficiency, U.S. Water Resources Council.
Identifiers: *Opportunity cost, 'Principles and Standards'(1973).

Economic implication of the set of guidelines promulgated by the Water Resources Council, entitled 'Water and Related Land Resources--Establishment of Principles and Standards for Planning,' effective as of October 25, 1973 are discussed. 'Priciples and Standards' outline two objectives: (1) to enhance national economic development by increasing the GNP and by improving national efficiency, and (2) to enhance the quality of the environment by the management, conservation, preservation, creation, restoration, or improvement of the quality of certain natural and cultural resources and ecological systems. Four accounts to be used in developing alternative plans are delineated: one for each of the two objectives, one for regional development, and one for social well-being. The accounts of the new system are not additive and are not mutually exclusive. The national and regional economic development accounts use menetary measures, while the environmental quality and social factors accounts are largely attribute-type. The application of the objectives and accounts to specific projects is controversial. The qualitative nature of the regional development and social well-being data makes both difficult to evaluate. The WRC application of the concept of opportunity cost is a departure from the procedures of some accountants, especially with regards to discount rates. (See also W75-10354) (Becker-Wisconsin)
W75-10355

THE ECONOMIC IMPACT OF MERCURY POLLUTION ON FISHERIES AND OTHER RELATED BUSINESSES AROUND PICKWICK LAKE,
Auburn Univ., Alabama. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W75-10356

INTERNATIONAL PRODUCTION ASPECTS OF WATER AND ENVIRONMENTAL QUALITY CONTROL,
Auburn Univ., Alabama. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W75-10357

INDUSTRIAL INTERDEPENDENCIES AND EXTERNAL DISECONOMIES OF WATER RESOURCES,
Auburn Univ., Alabama. Dept. of Economics.
M. M. Baker, M. M. Yarbrough, and D. R. Street.
School of Business Research Series 4, November 1973, p 58-72, 3 fig, 1 tab, 4 ref. OWRT B-037-ALA(1).

Descriptors: *Industrial production, *Industrial water, *Water pollution effects, *Economic impact, Water utilization, Income, Water demand, Regional analysis, Diseconomies of scale, Water quality, Input-output analysis.
Identifiers: *Industrial interdependencies, *Externalities.

External effects are present whenever a firm's production function depends on the activities of another firm. The concept of external effects in water-using firms is explained using input-output analysis. Economic sectors are specified in terms of the interdependence between water-using, non-water-using, and final demand sectors. For every acre-foot of water not available for use, the water-using sector will reduce purchases, which in turn reduces both income payments for the households and income spent on consumption goods. The case of the non-water-using sector being completely dependent on the raw material inputs from the water-using sector is discussed. The types of interdependency effects are: (1) a household income effect, (2) a business income effect on suppliers of production inputs and related sectors, and (3) on accumulative effect on the public sector through loss of revenues and reduction in use of public facilities. Specifically, the regional external effects on the public sector from water pollution include underutilization of public facilities in declining areas and the resulting economies and diseconomies of providing services. Externality effects are present to the extent that factors of production are immobile and unable to replace the income losses due to the decline in purchases by the water-using sector. (See also W75-10354) (Becker-Wisconsin)
W75-10358

VALLEY DESIGN IN URBAN GROWTH CENTRES,
University of New South Wales, Kensington (Australia). Faculty of Military Studies.
A. J. Bonham.
Water (Journal of the Australian Water and Wastewater Association) Vol 2, No 1, p 21-23, March 1975. 1 fig, 10 ref.

Descriptors: *Urban drainage, *City planning, *Flood protection, *Recreation facilities, *Flood plains, Storm drains, Urban runoff, Cities, Land use, Design, Valleys, Natural streams, *Australia.
Identifiers: Canberra(ACT).

A criticial study of the design of major storm drainage systems has been made with special reference to new urban growth centers, and with Canberra (Australia) as a model. The study reveals that public open spaces may be located on designed flood plains, thus preserving the environmental quality of the valley, reducing the storm peak discharges downstream and at the same time substantially reducing the overall cost of storm drainage works. (CSIRO)
W75-10643

THE MASTER PLAN FOR WATER-SUPPLY IN THE REGIONAL MUNICIPALITY OF OTTAWA-CARLETON,
Ottawa-Carleton Regional Municipality, Ottawa (Ontario).
For primary bibliographic entry see Field 3D.
W75-10710

WATER SUPPLY FROM RENOVATED WASTEWATER--A RESOURCE MANUAL FOR MASSACHUSETTS PLANNERS, PUBLIC OFFICIALS AND CITIZEN GROUPS.
Clark Univ., Worcester, Mass.
For primary bibliographic entry see Field 5D.
W75-10722

RIVERS IN THE CITY,
R. Mann.
Praeger Publishers, New York New York, 1973. 256 p.

Descriptors: *Environmental control, *Rivers, *Land use, *Water resources development, *Harbors, *Canals, *Tunnels, *Highway effects, Potomac River, Hudson River, *Regional development, River basin development, *Urbanization, Recreation, United States, Europe, *Cities, City planning, *Water quality.

Identifiers: Arno River, Amstel River(Netherlands), Limmat/Sihl Rivers(Aurich), Rhine River(Netherlands), Seine River, Ruhr River(Germany), Oise River, Marne River(France), Thames River, Lea River(London England), Tyne River(England), Charles River(Mass).

The most intensively used and abused resource on earth--the urgan river--is surveyed in terms of the crises of mismanaged rivers and wasteland riversides and the important aspects of progress in the conservation of the river landscape. A brief discussion is presented of the historical, economic, sociological, aesthetic and technical aspects of the problem. How fifteen major urban regions have utilized their river landscapes in the process of urban and regional development is described. The urban regions are: Florence (Arno); Venice (the canals); Amsterdam (Amstel/the canals); Paris (Seine); Paris region (Seine/Oise/Marne); Lyons (Saone/Rhone); Zurich (Limmat/Sihl); London (Thames); London (Lea); Ruhr region (Ruhr); Rotterdam (Rhine/Meuse); Tyneside (Tyne); Washington, D.C. (Potomac); Boston (Charles); New York (Hudson). Linking the old and new to provide recreational facilities and aesthetic setting by utilizing urban river landscapes (Amsterdam and Paris) is contrasted with situations created by heavy industrialization and growth problems along urban river banks (London and Tyneside). Encroachment of high-rise buildings, expressways, parking lots and ill-designed creation structures threaten riversides of Washington, D.C., Boston, Paris and Zurich. Use of knowledge and experience, sufficient funds, and planning on the broadest scale must be employed to preserve and promote urban riversides of high environmental quality. (Hufschmidt-North Carolina)
W75-10723

ROLE OF THE PUBLIC IN WEATHER MODIFICATION,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 3B.
W75-10777

PANEL REVIEW OF THE TAXONOMIC STRUCTURE OF THE STRAW MAN.
California Univ., Riverside. Program in Environmental Economics.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 892, $3.75 in paper copy, $2.25 in microfiche. Project No. DACW31-72-0-0060, Planning and Evaluation for the Straw Man Research Project Report, PRWG-120-3, University of California, Riverside, April, 1973. 40 p, 11 ref. OWRT C-3377(3721)(2).

Descriptors: *Water resources development, *Methodology, *Planning, *Evaluation, *Social aspects, Mathematical models, Systems analysis, Behavior, Technology, Decision making, Alternative planning, Constraints, Costs, Benefits, Ethics.
Identifiers: *Straw Man, *Social indicators, Connectives, Action variables, Tree structures, Metatheory, Axiomatic value theory, Disaggregation.

The Technical Committee, under the auspices of the Directors of the Water Resources Research Centers of the Thirteen Western States, initiated the development of a methodology relating water resources planning to the achievement of national and regional goals. The Committee developed the Straw Man, a model framework of connectives between social goals and water-related activities. In order to justify its logical structure, consistency, completeness, and underlying assumptions, a small review panel was asked to evaluate the taxonomic structure of the Straw Man. This volume, composed of three documents, is the resulting report. The first article is that of the Technical Committee--an introduction to the Straw Man methodology and a list of issues to be considered by the panel members. The second and third documents are evaluation reports by panel members. The Committee believes the interchange to have been helpful to the entire Straw Man project, particularly in distinguishing a prior issue in the methodology from ad hoc issues arising in its application. (See W75-10807 thru W75-10809) (Bell-Cornell)
W75-10806

PANEL EVALUATION OF THE LOGICAL STRUCTURE, CONSISTENCY, AND UNDERLYING ASSUMPTIONS OF THE 'STRAWMAN' METHODOLOGY.
California Univ., Riverside. Technical Committee of the Water Resources Centers of the Thirteen Western States.
In: Panel Review of the Taxonomic Structure of the Straw Man. Project No. DACW31-72-C-0060, Planning and Evaluation for the Straw Man Research Project. Report PRWG-120-3, University of California, Riverside. April, 1973. 6 p, 1 ref.

Descriptors: *Water resources development, *Methodology, *Evaluation, *Planning, *Social aspects, Behavior, Technology, Mathematical models, Systems analysis, Economics, Water policy.
Identifiers: *Straw Man, Disaggregation, Social indicators, Connectives, Action variables, Subgoals.

The Technical Committee of the Water Resources Centers of the Thirteen Western States has devised the Straw Man model for relating national and regional social goals to water resources planning and use decisions. The model is a hierarchical set of nine overarching general societal goals arrived at independently of water resources development. In the model, the goals are disaggregated into subgoals which are eventually linked to water policy action variables through social indicators (changes or events having social significance). The methodology is introduced and a list of issues to be considered by members of a panel formed to evaluate the taxonomic structure of the Straw Man is given. Since the set of nine general goals has not been tested for the degree of its completeness, a sharper delineation of each goal is recommended. (See also W75-10806) (Bell-Cornell)
W75-10807

COMMENTS ON THE STRAW MAN,
California Univ., Riverside. Dept. of Philosophy.
D. Harrah.
In: Panel Review of the Taxonomic Structure of the Straw Man. Project No. DACW31-72-C-0060, Planning and Evaluation for the Straw Man Research Project, Report PRWG-120-3, University of California, Riverside, April 1973. 17 p, 6 ref.

Descriptors: *Water resources development, *Methodology, *Evaluation, *Decision making, Planning, Social aspects, Mathematical models, Systems analysis, Water policy.
Identifiers: Straw Man, Disaggregation, Utility function, Decision theory, Tree structure, Axiomatic value theory.

The Technical Committee of the Water Resources Centers of the Thirteen Western States devised the Straw Man model for relating national and regional goals to water resources planning and decision making. The Straw Man methodology is evaluated and suggestions are made for extending and strengthening it. The Technical Committee's main aim is the development of a methodology for a two-level decision system appropriate in the context of decisions affecting water resources. Discussed are decision theory for the Straw Man goal system and the elements of a utility function suitable to the methodology. In the Straw Man, the utility function is constructed as a hierarchy of goals and subgoals, with utility weights assignable to the component goals and subgoals; the hierarchy has a simple tree structure. Simplicity and clarity have been allowed to dominate the need for theoretical richness and precision; the value theory has been cast in too simple a form, and the requirements imposed on interpretations of the theory have been too strict. The theory of goals should be formulated as a hypothetico-deductive theory in axiomatic form--as an empirical theory of the value system of the social group in question. The tree structure would then be developed as a simplified representation of the theory, useful for computational and heuristic purposes. Answers are included to questions posed by the Committee. (See also W75-10806) (Bell-Cornell)
W75-10808

REPORT TO THE TECHNICAL COMMITTEE OF THE WATER RESOURCES CENTERS OF THE THIRTEEN WESTERN STATES,
Princeton Univ., N.J. Dept. of Philosophy.
T. Nagel.
In: Panel Review of the Taxonomic Structure of the Straw Man. Project No. DACW31-72-C-0060, Planning and Evaluation for the Straw Man Research Project, Report PRWG-120-3, University of California, Riverside, April 1973. 14 p, 1 ref.

Descriptors: *Water resources development, *Methodology, *Decision making, *Evaluation, Planning, *Social aspects, Mathematical models, Systems analysis, Water policy, Cost-benefit analysis, Ethics, Value, Constraints.
Identifiers: Straw Man, Primary values, Equality, Individual rights.

The Straw Man methodology has been devised to relate national and regional goals to water resources development. The overall concept is that, by taking certain actions, decision makers can realize particular goals and their associated values. The ethical assumptions of the Straw Man methodology are considered. The method presupposes an idea of how decisions are made, how values are assigned, and of how results can be obtained by balancing multiple relevant considerations. This idea is too simple, with not enough thought given to the relation between the individual factors. The methodology has been offered as a replacement for the crude economic cost-benefit analysis which has until recently governed public water policy decisions. The aim has been to extend the range of considerations that will influence decision making by including goals other than economic ones, with hopes of balancing the costs against benefits. More complex structures are needed to accomplish this. Considerations which determine a rational choice are divided into three categories: (1) assignment of primary values; (2) distributional factors; and (3) prior constraints on means to be used in pursuit of goals. These considerations are discussed in detail in terms of human values, equality, and ethics. Examined are utilitarianism, satisfaction of preferences, and individual rights. Recommendations are made for improving the Straw Man ideology, and thus methodology. (See also W75-10806) (Bell-Cornell)
W75-10809

PROCEEDINGS OF THE GRADUATE STUDENT SYMPOSIUM OF THE TECHNICAL COMMITTEE OF THE WATER RESOURCES CENTERS OF THE THIRTEEN WESTERN STATES.
California Univ., Riverside. Program in Environmental Economics.
For primary bibliographic entry see Field 6A.
W75-10810

METHODOLOGICAL APPLICATION OF THE STRAW MAN DECISION STRUCTURE TO A HYPOTHETICAL CASE: THE DORFMAN-JACOBY WATER QUALITY MODEL,
California Univ., Riverside.

For primary bibliographic entry see Field 6A.
W75-10811

SOCIAL INDICATORS AND CONNECTIVES,
California Univ., Riverside.
For primary bibliographic entry see Field 6A.
W75-10812

TOWARDS A SHARPER CONCEPT OF AN ACTION VARIABLE,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 6A.
W75-10813

METHODOLOGICAL PROBLEMS IN APPLYING THE STRAW MAN TO REAL LIFE PROBLEMS,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 6A.
W75-10814

QUALITATIVE SIGN MATRIX MANIPULATION,
California Univ., Riverside.
For primary bibliographic entry see Field 6A.
W75-10815

NECESSARY ADAPTATIONS FOR SIGNIFICANT UTILIZATION OF THE INFORMATION SYSTEM,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 6A.
W75-10816

A METHOD OF DISAGGREGATION,
Nevada Univ., Reno.
For primary bibliographic entry see Field 6A.
W75-10817

EGALITARIANISM,
Washington Univ., Seattle.
For primary bibliographic entry see Field 6A.
W75-10818

A CONNECTIVES MODEL RELATING WATER POLICY ACTION VARIABLES TO RECREATIONAL OPPORTUNITY SOCIAL INDICATORS,
Utah State Univ., Logan.
For primary bibliographic entry see Field 6A.
W75-10819

ALGORITHMIC MODELING AND THE STRAW MAN,
Utah State Univ., Logan.
For primary bibliographic entry see Field 6A.
W75-10820

DERIVATION OF RESERVOIR OPERATING RULES BY ECONOMIC ANALYSIS,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 4A.
W75-10825

ANALYSIS OF RESERVOIR RECREATION BENEFITS,
Kentucky Water Resources Inst., Lexington.
R. C. Tussey, Jr.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 546, $6.25 in paper copy, $2.25 in microfiche. Research Report No 2, 1967. 158 p, 26 fig, 28 tab, 39 ref. OWRR A-006-KY. 14-01-0001-787.

Descriptors: Recreation, *Recreation demand, Recreation facilities, Reservoirs, *Regression analysis, *Benefits, Evaluation, *Kentucky, *Cost analysis, Estimating.
Identifiers: Dewey Reservoir(Kent), Rough River Reservoir(Kent).

Recreation visitation to two Kentucky reservoirs (Rough River and Dewey) constructed by the U.S. Army Corps of Engineers was studied to develop mathematical expressions for estimating numbers of visitors and recreation benefits. Regression analysis was used to relate characteristics of 168 origin areas (120 Kentucky counties, the District of Columbia, and the remaining states excluding Hawaii and Alaska) to visitation from that area to Rough River Reservoir. The resulting equations were than applied to Dewey to test their generality. Good results were obtained when only air distance and population were used as the independent variables. Correlations including the age and income of the population, urbanization, highway quality, and competition from other reservoirs did not significantly improve the results for Rough River and resulted in a worse correlation when applied to Dewey. Recreation benefits from the two reservoirs were estimated from a demand curve where the cost of effective travel distance was used to estimate price and the regression equation was used to estimate visitation. The effective or out-of-the-way distance (as contrasted with total distance) to the reservoir was estimated. (Huffsey-Kentucky)
W75-10826

THE EFFECT OF LANDOWNER ATTITUDE ON THE FINANCIAL AND THE ECONOMIC COSTS OF ACQUIRING LAND FOR A LARGE PUBLIC WORKS PROJECT,
Kentucky Water Resources Inst., Lexington.
J. M. Higgins, Jr.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-244 536, $6.25 in paper copy, $2.25 in microfiche. Research Report No 3, 1967. 153 p, 10 fig, 16 tab, 28 ref. OWRR A-006-KY. 14-01-0001-787.

Descriptors: Land appraisals, Land use, *Econometrics, Financial feasibility, *Attitudes, *Kentucky, Costs, *Property values, Cost analysis, Reservoirs.
Identifiers: Landowners.

The purpose is to examine the various economic and financial costs relating to the acquisition of property required for the construction of three reservoirs and to determine if any correlation could be made between the attitudes of the landowners selling property and the costs. Rough River Reservoir, Dewey Reservoir, and West Fork of Mill Creek Reservoir were studied. The costs involved in purchasing right-of-way were classified qualitatively and quantified to the extent possible. A procedure was devised to quantify 15 factors influencing attitude and an equation was derived to predict the landowner's attitude from these determining factors. Two plots were made of attitude versus the associated costs in order to observe the effect of attitude on costs. The results indicate that although the problem is complex, it is possible and practical to quantify the landowner's attitude and to define the relationship between this attitude and the associated costs. (Huffsey-Kentucky)
W75-10827

REVIEW OF THE ECONOMIC BENEFITS AND COSTS RESULTING FROM DEWEY RESERVOIR,
Kentucky Water Resources Inst., Lexington.
D. H. Rosenbaum.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-244 485, $5.75 in paper copy, $2.25 in microfiche. Research Report No 5, 1967. 118 p, 14 fig, 37 tab, 24 ref. OWRR A-006-KY. 14-01-0001-1085.

Descriptors: Reservoirs, Tax rates, Taxes, Flood control, Recreation, *Cost-benefit ratio, *Kentucky, Economics, *Income analysis, *Income distribution, Benefits, Taxes, Flood damage, Reviews.
Identifiers: Dewey Reservoir(Kent).

The economic effects of the construction of Dewey Reservoir in Floyd County, Kentucky were evaluated. Primary emphasis was placed on determining the degree the project had shifted income to this economically underdeveloped area by determining the incomes of those receiving project benefits and those paying project costs. The income redistribution effects of all benefits and costs associated with Dewey Reservoir were evaluated by assuming that the Federal income tax structure indicates the marginal value of income to individuals in the various income brackets. Major benefits from the Dewey Project have been: flood control, $722,166 annually, and recreation, $814,720 annually. Comparing these benefits with the average annual cost of the project yeilds a direct benefit cost ratio of 1.58. The flood damage reduction benefits have negative redistribution effects (-$77,670), because those receiving the benefits have incomes higher than that of the average taxpayer. The positive income redistribution benefits in decreasing order resulted from: repayment incidence ($197,860), recreation benefits ($133,720), project expenditures ($26,618), and Mississippi River benefits ($294). (Huffsey-Kentucky)
W75-10828

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

ANALYZING REIMBURSEMENT MECHANISMS FOR RESOURCE DEVELOPMENT PROJECTS,
Wyoming Univ., Laramie. Div. of Agricultural Economics.
T. L. Dobbs, and C. E. Huff.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-243 917, $3.25 in paper copy, $2.25 in microfiche. Wyoming Agricultural Experiment Station Journal Article No 652, 1974, 25 p, 2 tab, 22 ref. OWRT C-4351(9063)(2).

Descriptors: *Water resources development, *Cost repayment, *Economic impact, *Social impact, Inter-basin transfers, Regional development, Economic efficiency, Equity, Wyoming, Methodology, Decision making.
Identifiers: Development cost reimbursement, Case study.

Policies proposed by the National Water Commission will create a need for a systematic examination of possible reimbursement mechanisms for project bonded indebtedness and operation and maintenance costs. Increased reliance on the assessment of beneficiaries and the necessity of integrating project evaluation and cost-sharing formulation for water resource development projects are stressed. A framework for analyzing regional resource development projects is developed around an impact matrix and a reimbursement matrix. The impact matrix includes the various development, environmental/recreational, and socical effects of a project on various sectors within the region of concern, while the reimbursement matrix accounts for all user charges, taxes, and other repayment mechanisms. The analytical framework is applied to a proposed interbasin water transfer project involving water transfer from Wyoming's Green River to its North Platte River Basin for municipal and industrial (coal development) purposes. Positive and negative regional effects of the project were estimated from secondary sources for one county to be affected. Criteria set forth to be used in evaluating reimbursement mechanisms are: (1) efficiency, (2) equity, (3) revenue raising ability, and (4) administrative feasibility. The framework presented facilitates examination of marginal-cost pricing, public finance, and public utility-type reimbursement mechanisms. (Becker-Wisconsin)

W75-10353

DERIVED DECISION RULES FOR POLLUTION CONTROL IN A GENERAL EQUILIBRIUM SPACE ECONOMY,
Williams Coll., Williamstown, Mass. Dept. of Economics.
T. H. Tietenberg.
Journal of Environmental Economics and Management, Vol 1, No 1, p 3-16, 1974.

Descriptors: *Pollution abatement, *Decision making, *Pollution taxes(Charges), *Theoretical analysis, Resource allocation, Costs, Tax rates, Welfare(Economics), Mathematical models, Equations, Intangible costs.

The conventional externality model is expanded to include spatial detail and by using this model theorems are provided (which require no information on either damage costs or control costs) as the basis for reducing the information content of desirable pollution control policies. This spatially defined general equilibrium model defines and characterizes cost minimizing and efficient resource allocation. Institutional content is introduced and resource allocations which characterize decentralized equilibria are described in the context of a private ownership space economy containing a government which imposes specific taxes on emitters. Three theorems of the allocations are proven under alternative assumptions, two of which provide a basis for easily computable tax structures. The modified model includes a description of an externality which is related to meteorology and hydrology of air and water pollution. The model was also used to derive a theorem concerning efficient externality control using specific taxes. It is demonstrated that several decision rules which require considerably less information can be derived from this model by sacrificing some but not all of the properties of efficiency. Thus, while there is no focus on optimality of any of the derived decision rules, they do represent alternatives with somewhat more clearly delineated properties. (Auen-Wisconsin)
W75-10360

POLITICAL PARTICIPATION AND WATER RATES. A CLOSER LOOK,
California Univ., Santa Barbara.
L. J. Mercer, and W. D. Morgan.
Water Resources Bulletin, Vol 10, No 6, p 1302-1307, 1974. 1 tab, 4 ref.

Descriptors: *Water rates, *Political aspects, *Mathematical models, Average prices, Pricing, Income, Costs, Water districts, Metropolitan Water Dist. of So. Cal.
Identifiers: Public participation.

Patrick Mann's (Water Resources Bulletin Vol 9, No 5: 976-984, Oct 1973) conclusions that increased political activity results in lower water rates are questioned because of potential misspecification of his underlying model and the general weakness of this political variable. Among some other equations evaluated are (1) his results for the Mountain, Pacific, and West North Central states, which are based on the dominance of the Western sub-region without considering the institutional characteristics which exist in the West, particularly in the arid West; the Western states receive water supplied by the Bureau of Reclamation at a price lower than resource costs thus the rate structures would be lower. (2) Some states, particularly California, have granted water agencies access to additional revenue by permitting them to levy a property tax, which Mann's model misspecified by omitting the variable for other revenue sources. (3) The dependent variable should be the average water rate since the quantity for which the minimum rate applies varies widely across water agencies. (4) The political proxy variable used could distort the actual level of political activity. It is concluded that the case for the hypothesis that political influence of residential consumers (as measured by Mann) has significant impact on water rates is less than satisfactory. (Auen-Wisconsin)
W75-10361

ON THE PEAK-LOAD PRICING OF URBAN WATER SUPPLY,
Clark Univ., Worcester, Mass. Graduate School of Geography.
S. L. Feldman.
Water Resources Research, Vol 11, No 2, p 355-356, April 1975. 10 ref.

Descriptors: *Water demand, *Prices, Flow measurement, *Peak loads, *Elasticity of demand, Water allocation(Policy), Water costs, *Water supply, Economics, Instrumentation, Data collections, Telemetry, Water measurement, Equity, Pressure head, Water distribution(Applied).
Identifiers: *Peak-load pricing, Maximum day, Peak-hour, *Urban water supply.

Since summer lawn sprinkling water demands account for a large portion of water supply system design, a seasonal commodity charge has been suggested by Hanke and Davis. A more 'responsive' system of charges is proposed that has maximum day and peak-hour (plus fire flow) parameters which account for 85% of municipal water system costs. Thus a peak-hour pricing scheme would encourage restricted consumption at the specific peaks rather than throughout the summer. Fire flow pressure and the social externalities of green lawns could be assured in a more equitable peak-load pricing. Commercial and industrial users and residences with irrigable areas would be fitted with peak load meters if their water use justified the expense. A completely mechanical meter which shifts to different register scales with the decrease in pressure occurs during periods of greater demand could increase the price per gallon during these peak flows periods. Alternatively, remote control telemetering techniques now being used for meter reading could enable the utility to change its customers' meters to a different scale during maximum day and peak-hour periods. Consumers would be encouraged to sprinkle at incentive prices during off-peak hours. Average rates could be lowered as system demand peaks were shaved and troughs filled and the system used more efficiently. (Herr-North Carolina)
W75-10706

WATER RATES: AN ASSESSMENT OF CURRENT ISSUES,
California Univ., Berkeley.
S. H. Hanke.
Journal of the American Water Works Association, Vol 67, No 5, p 215-219, May, 1975. 1 fig, 21 ref.

Descriptors: *Water rates, *Pricing, *Water costs, *Water demand, *Economic efficiency, Economics of scale, Unit costs, Average costs, Economic impact, Elasticity of demand, Planning, Financing, Equity, Cost allocation, Incremental income.
Identifiers: Washington Suburban Sanitation Commission(MD), Denver Water Board(CO), East Bay Municipal Utilities District(Oakland CA), Fairfax County Water Authority(VA).

Tradiational water pricing policies have been based on accounting costs. Rate structures have had a fixed charge per unit time and declining-block commodity charges designed to generate needed revenue. Physical and financial planning have been separate activities, as pricing was based on historical average costs. The economic approach bases pricing on marginal or incremental costs, insuring more efficient resource allocation. Prices reflect the value of resources used or saved by a change in consumption. Demand, and therefore physical planning, depends in part on the price per unit of water. Rate structures using average costs create the illusion of uniform costs. Most major water system facilities are designed for maximum day demands determined by seasonal use. The greatest use peak is during summer lawn irrigation. Uniform prices averaged over the seasons understate peak-load incremental costs, inefficiently encouraging peak-load consumption. Likewise over space, costly distribution to low density development, when charged the uniform rates of less expensive high density distribution areas, tends to understate costs and subsidize population diffusion and urban sprawl. The Washington Suburban Sanitation Commission, Denver Water Board, East Bay Municipal Water District, and Fairfax County Water Authority economic-based rate structures are outlined and cited as important steps toward conservation, equity, and economic efficiency objectives. (Herr-North Carolina)
W75-10707

FINANCING WATER WORKS,
Studley Shupert and Co., Inc., Boston, Mass.
For primary bibliographic entry see Field 3D.
W75-10712

AN ECONOMIC MODEL OF WASTE OIL RECOVERY, REPROCESSING AND DISTRIBUTION SYSTEMS,
Environmental Quality Systems, Inc., Rockville, Md.
For primary bibliographic entry see Field 5D.
W75-10768

NUCLEAR POWER PLANT COOLING SYSTEM SELECTION,
Kaiser Engineers, Oakland, Calif.
S. C. Ko.
Journal of the Power Division, Proceedings of ASCE, Vol 101, No PO1, Proceedings paper No 11405, p 55-67, July 1975. 6 tab, 6 ref.

Descriptors: *Nuclear powerplants, *Cooling water, *Alternative planning, *Decision making, Optimization, Quality control, *Cooling ponds, Evaluation, Economics, Constraints, Land use, Recreation, Systems analysis, Water resources.
Identifiers: *Cooling systems, *Environmental impact statements, *Cost-effectiveness, *Fixed-effectiveness approach, Sensitivity analysis, Cost minimization, Cooling efficiency, Spray channels.

A slightly modified version of Kazanoski's method of cost-effectiveness was used to identify the optimal cooling system for a 4,400-MW nuclear power plant. Three alternate cooling systems were analyzed: (1) recirculating cooling pond; (2) recirculating spray channel; and (3) a combination of spray channel and cooling pond. Each of the three alternative cooling systems was evaluated and analyzed against a set of criteria to satisfy the goals of minimal environmental impact, least-cost expenditure, and maximum cooling efficiency. Since the fixed-effectiveness approach, as opposed to the fixed-cost approach, was chosen, all alternate systems were designed and optimized for meeting thermal performance and effluent control specifications. The following effectiveness criteria were used to evaluate the differential effectiveness of each system: ecological impact, thermal performance, recreational potential, and system flexibility. The pitfalls of making a biased endorsement of a system were examined using sensitivity analysis; considered was a fourth alternative, a closed cooling pond with sufficient surface area to dissipate the heat load required and a supplemental system for cooling the blown water. The dangers and fallacies of weighting and ranking were considered. This cost-effectiveness analysis with a tabular display presented facts to decision makers both quantitatively and qualitatively, and conclusions focused on specific items. (Bell-Cornell)
W75-10822

DERIVATION OF RESERVOIR OPERATING RULES BY ECONOMIC ANALYSIS,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 4A.
W75-10825

ANALYSIS OF RESERVOIR RECREATION BENEFITS,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 6B.
W75-10826

THE EFFECT OF LANDOWNER ATTITUDE ON THE FINANCIAL AND THE ECONOMIC COSTS OF ACQUIRING LAND FOR A LARGE PUBLIC WORKS PROJECT,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 6B.
W75-10827

REVIEW OF THE ECONOMIC BENEFITS AND COSTS RESULTING FROM DEWEY RESERVOIR,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 6B.
W75-10828

6D. Water Demand

INDUSTRIAL INTERDEPENDENCIES AND EXTERNAL DISECONOMIES OF WATER RESOURCES,
Auburn Univ., Alabama. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W75-10358

INDIGENOUS PEOPLES OF POLAR DESERTS,
Department of Indian Affairs and Northern Development, Ottawa (Ontario).
G. W. Rowley.
In: Polar Deserts and Modern Man, T. L. Smiley and J. H. Zumberge, eds., University of Arizona Press, Tucson, p 99-101, 1974. 18 ref.

Descriptors: *Polar regions, Social mobility, Hunting, *Government supports, *Lakes, Fishing. Identifiers: Eskimos, Tree-line, Whales, Walrus, Seals, Kayak.

The indigenous people of the Arctic are discussed, with emphasis on their means of survival and lifestyle. In the Arctic man cannot live totally on land production, but must depend heavily upon fish and sea-mammals from rivers, lakes and the sea. In North America the indigenous people are the Eskimos, who depend upon seals, whales, and walrus for fuel, clothing, and food. Main characteristics of the North American Eskimos that have helped them are (1) skill in hunting and technology, (2) mobility, (3) social structure, (4) mutual dependence, and (5) patience and emotional control. Government services such as schools, nursing stations, and housing have been provided to help the Eskimo. Major governmental problems in the polar desert today are (1) helping to strengthen traditional ways by providing amenities for the Eskimos who wish to follow this lifestyle, and (2) helping those who wish to make the difficult transition to the technological age. (Garrettson-Arizona)
W75-10460

EVALUATION OF GROUND WATER RESOURCES: SACRAMENTO COUNTY,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 2F.
W75-10546

WATER FOR INDUSTRIAL DEVELOPMENT IN ALCORN, ITAWAMBA, PRENTISS, AND TISHOMINGO COUNTIES, MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 3E.
W75-10581

ON THE PEAK-LOAD PRICING OF URBAN WATER SUPPLY,
Clark Univ., Worcester, Mass. Graduate School of Geography.
For primary bibliographic entry see Field 6C.
W75-10706

WATER RATES: AN ASSESSMENT OF CURRENT ISSUES,
California Univ., Berkeley.
For primary bibliographic entry see Field 6C.
W75-10707

THE MASTER PLAN FOR WATER-SUPPLY IN THE REGIONAL MUNICIPALITY OF OTTAWA-CARLETON,
Ottawa-Carleton Regional Municipality, Ottawa (Ontario).
For primary bibliographic entry see Field 3D.
W75-10710

WATER WORKS IMPROVEMENTS--SPRINGFIELD, VERMONT,
Dvfresne-Henry Engineering Corp., North Springfield, Vt.
For primary bibliographic entry see Field 3D.
W75-10713

ECONOMIC IMPACT OF THE CONVERSION OF WATER FROM IRRIGATION TO MUNICIPAL AND INDUSTRIAL USE IN THE RIO GRANDE BASIN OF NEW MEXICO,
New Mexico State Engineer, Santa Fe.
E. A. Lewis.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 67-84, 1974. 18 ref.

Descriptors: *Water policy, *Irrigation water, *Municipal water, *Industrial water, *New Mexico, *Rio Grande River, Projections, Planning, Urbanization, Estimating, Water allocation(Policy), Model studies, Mathematical models, Economics, Irrigation, Industry, Agriculture, Rivers, Groundwater, Water utilization, Water requirements.

The preparation of a planning report on the New Mexico State Water Plan is under way. Assuming augmentation is not available and if projected requirements are to be met, there will have to be changes in water use. An economic model may provide a means of measuring the economic impacts of such changes. This model is a linear programming model designed to represent New Mexico's economy. Retiring irrigation water rights to meet municipal, industrial, and recreational water demands is presently taking place in the state. It is assumed this will continue. The logic of this assumption is based on economics and the fact that irrigation is the only use which is large enough to supply the anticipated increased demands for water. The model is being used to project the water uses in the Rio Grande Basin of New Mexico to 1980, 2000, and 2020, using 1970 data as input, The economic impacts of these changes in water uses are being evaluated. Due to some difficulties in model building, reasonable results were not obtained in time for this paper. The water problems of the Rio Grande Basin were discussed, and the model was described. (See also W75-10769) (Sims-ISWS)
W75-10771

IMPACTS OF RURAL TO URBAN WATER USE,
Texas Office of the Governor, Austin. Water Task Force.
J. O. Williams.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 85-98, 1974. 2 fig, 3 tab, 1 ref.

Descriptors: *Water policy, *Urbanization, *Water demand, Urban sociology, Land use, Economics. Water importing, Groundwater, Irrigation, *Municipal water, Environmental effects, Social impact, Social change, Political aspects, Federal government, State governments, Governmental interrelations, Population, Distribution patterns, Water use, Water supply.

In 1930, 43.7% of the nation's population was classified by the Bureau of Census as residing in rural areas, with the remaining 56.3% identified as urban dwellers. By 1970, the rural population had dropped to 26.5% and the percentage of urban inhabitants had climbed to 73.5%. In 1930, out of a total water withdrawal of 110 billion gallons per day for all purposes, 60 billion gallons per day were used in irrigated agriculture, 8 billion gallons per day for public water utilities, 2.9 billion gallons per day for rural domestic uses, 21 billion gallons per day for industrial and miscellaneous, and 18 for steam electric utilities. By 1970, total water withdrawal had more than tripled to 370 billion gallons per day, irrigation use had more than doubled to 130 billion gallons per day, and public water utilities accounted for 27 billion gallons per day. A substantial research effort should go into the development of methodologies that would enable the state and federal levels of government to address the entire spectrum of land and water use problems that have been associated with or caused by the rural to urban shift that has taken place in this nation. (See also W75-10769) (Sims-ISWS)
W75-10772

6E. Water Law and Institutions

INTERNATIONAL PRODUCTION ASPECTS OF WATER AND ENVIRONMENTAL QUALITY CONTROL,
Auburn Univ., Alabama. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W75-10357

POLLUTION CONTROL AND OPTIMAL TAXATION: A STATIC ANALYSIS,
University Coll., London (England). Dept. of Political Economy.
W. Beckerman, and A. Markandya.
Journal of Environmental Economics and Management, Vol 1, p 43-52, 1974. 3 ref.

Descriptors: *Pollution taxes(Charges), Marginal costs, Resource allocation, Mathematical studies, Tax rates, Marginal costs.

Those concerned with controlling pollution by taxation face the difficulty of identifying the optimum tax and often there is the problem of deciding how it is more economical to clean up pollutants by some collective private or public facility than to induce polluters to abate their own effluent in an uncoordinated manner in response to a pollution tax or direct regulation. A theoretical model is devised which features the introduction, into both the comsumption and production function of the economy of (1) the pollutant and (2) some 'anti-pollutant,' such as water purification facilities or soundproofing--to be regarded as 'bads' and 'anti-bads,' which contribute to the identification of an optimum tax for the generation of pollutants when both 'anti-bands' and 'bads' are included in the utility function. 'Bads' and 'anti-bads' are introduced via a technological tradeoff relationship

with substitution allowed. In some instances in order to determine the optimum tax it may not be important to know the marginal damage function. The tradeoffs between private actions to reduce the effect of pollutants and collective provisions for pollutant control are analyzed. Under certain circumstances the appropriate tax on polluters can be calculated from observed defensive behavior of the receptors. (Auen-Wisconsin)
W75-10359

NEW LEGISLATIVE TENDENCIES FOR CONTROL OF WATER POLLUTION (NUEVAS TENDENCIAS LEGISLATIVAS EN EL CONTROL DE LA CONTAMINACION DE LAS AGUAS),
Centros de Estudios, Investigaciones y Aplicaciones del Agua, Granada (Spain).
For primary bibliographic entry see Field 5G.
W75-10384

THE LOWER COLORADO RIVER: A BIBLIOGRAPHY,
Arizona Western Coll., Yuma.
For primary bibliographic entry see Field 10C.
W75-10453

SAFE DRINKING WATER HAS BECOME A FEDERAL CASE.
For primary bibliographic entry see Field 5G.
W75-10469

EPA'S EFFLUENT GUIDELINES HAVE THEIR DAY IN COURT.
For primary bibliographic entry see Field 5G.
W75-10470

P. L. 92-500 (TWO YEARS LATER) IS NOT THE ANSWER,
For primary bibliographic entry see Field 5G.
W75-10471

MANUAL FOR PREPARATION OF ENVIRONMENTAL IMPACT STATEMENTS FOR WASTEWATER TREATMENT WORKS, FACILITIES PLANS, AND 208 AREAWIDE WASTE TREATMENT MANAGEMENT PLANS,
Environmental Protection Agency, Washington, D.C. Office of Federal Activities.
For primary bibliographic entry see Field 5D.
W75-10473

INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES.
National Oceanic and Atmospheric Administration, Rockville, Md.
For primary bibliographic entry see Field 2H.
W75-10547

INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES.
National Oceanic and Atmospheric Administration, Rockville, Md.
For primary bibliographic entry see Field 2H.
W75-10548

INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES.
National Oceanic and Atmospheric Administration, Rockville, Md.
For primary bibliographic entry see Field 2H.
W75-10549

INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES.
National Oceanic and Atmospheric Administration, Rockville, Md.
For primary bibliographic entry see Field 2H.
W75-10550

REPORT ON THE RIVER MASTER OF THE DELAWARE RIVER FOR THE PERIOD DECEMBER 1, 1973-NOVEMBER 30, 1974,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4A.
W75-10589

THE LAWS AND THEIR ENFORCEMENT; PROGRESS AMIDST PROBLEMS,
For primary bibliographic entry see Field 5G.
W75-10607

PROGRAM FOR CONTROL OF DISCHARGES OF POLLUTANTS TO NAVIGABLE WATERS.
For primary bibliographic entry see Field 5G.
W75-10608

DISPOSAL OF USED CRANKCASE AND OTHER OILS IN CANADA,
Department of the Environment, Ottawa (Ontario).
For primary bibliographic entry see Field 5D.
W75-10743

ENVIRONMENTAL ACTION AT PORT AUTHORITY AIRPORTS,
Port Authority of New York and New Jersey.
For primary bibliographic entry see Field 5G.
W75-10748

WASTE OIL--SOLUTION TO MARYLAND'S ENERGY CRISIS,
Maryland Environmental Service, Annapolis.
For primary bibliographic entry see Field 5D.
W75-10762

MASSACHUSETTS WASTE OIL MANAGEMENT ACTIVITIES,
Massachusetts Water Resources Commission, Boston. Div. of Water Pollution Control.
For primary bibliographic entry see Field 5D.
W75-10763

USERS' VIEW OF WEATHER MODIFICATION,
Kansas State Senate, Topeka. 39th District.
For primary bibliographic entry see Field 3B.
W75-10776

WELLTON-MOHAWK DRAINAGE AND THE MEXICAN SALT PROBLEM,
Wellton-Mohawk Irrigation and Drainage District, Ariz.
For primary bibliographic entry see Field 4A.
W75-10783

AMENDMENTS TO THE WATER ACT,
For primary bibliographic entry see Field 5G.
W75-10835

THE CONSEQUENCES OF ACCEPTING INDUSTRIAL WASTES INTO SEWERS; WATER POLLUTION RESEARCH AT STEVENAGE,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 5D.
W75-10842

6F. Nonstructural Alternatives

FLOOD PLAIN INFORMATION: OUACHITA RIVER, HOT SPRINGS CREEK, STOKES CREEK, MOLLY CREEK, GULPHA CREEK, CITY OF HOT SPRINGS, ARKANSAS.
Army Engineer District, Vicksburg, Miss.
For primary bibliographic entry see Field 4A.
W75-10559

FLOOD PLAIN INFORMATION: BUSHKILL CREEK, VICINITY OF EASTON, PENNSYLVANIA.
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 4A.
W75-10560

FLOOD PLAIN INFORMATION: BLOOMSBURG, COLUMBIA COUNTY, PENNSYLVANIA-SUSQUEHANNA RIVER.
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 4A.
W75-10561

FLOOD PLAIN INFORMATION: BRANDYWINE CREEK, CHESTER COUNTY, PENNSYLVANIA.
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 4A.
W75-10562

FLOOD PLAIN INFORMATION: GOLDSMITH GULCH, DUTCH CREEK, LILLEY GULCH, AND COON CREEK, VOLUME VI, DENVER METROPOLITAN REGION, COLORADO.
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W75-10563

FLOOD PLAIN INFORMATION: MEADOW CREEK, ALBEMARLE COUNTY AND CHARLOTTESVILLE, VIRGINIA.
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 4A.
W75-10564

FLOOD PLAIN INFORMATION: MACON COUNTY, ILLINOIS.
Army Engineer District, Chicago, Ill.
For primary bibliographic entry see Field 4A.
W75-10565

FLOOD PLAIN INFORMATION: EAST FORK ONE HUNDRED AND TWO RIVER, BEDFORD, IOWA.
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 4A.
W75-10566

FLOOD PLAIN INFORMATION REPORT: SENECA CREEK, MONTGOMERY COUNTY, MARYLAND.
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 4A.
W75-10567

FLOOD PLAIN INFORMATION: MILL RUN, BLAIR COUNTY, PENNSYLVANIA.
Army Engineer District, Baltimore.
For primary bibliographic entry see Field 4A.
W75-10568

SPECIAL FLOOD HAZARD INFORMATION REPORT: CHICKASAWHAY RIVER, WAYNESBORO, WAYNE COUNTY, MISSISSIPPI.
Army Engineer District, Mobile, Ala.
For primary bibliographic entry see Field 4A.
W75-10569

FLOOD PLAIN INFORMATION: BROOKINGS, BROOKINGS COUNTY, SOUTH DAKOTA, VOLUME I - DEER CREEK.
Army Engineer District, Omaha, Neb.
For primary bibliographic entry see Field 4A.
W75-10570

FLOOD PLAIN INFORMATION: WHITE CLAY CREEK, NEW CASTLE COUNTY, DELAWARE.
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 4A.
W75-10571

FLOOD PLAIN INFORMATION: SHABAKUNK CREEK, WEST BRANCH SHABAKUNK AND LITTLE SHABAKUNK CREEKS, MERCER COUNTY, NEW JERSEY.
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 4A.
W75-10572

FLOOD PLAIN INFORMATION: CATOMA CREEK, VICINITY OF MONTGOMERY, ALABAMA.
Army Engineer District, Mobile, Ala.
For primary bibliographic entry see Field 4A.
W75-10574

FLOOD PLAIN INFORMATION: UPPER RIVER ROUGE, MINNOW POND DRAIN, BELL BRANCH AND TARABUSI CREEK, WAYNE AND OAKLAND COUNTIES, MICHIGAN.
Army Engineer District, Detroit, Mich.
For primary bibliographic entry see Field 4A.
W75-10575

FLOOD PLAIN INFORMATION: WEST BRANCH SUSQUEHANNA RIVER, LYCOMING COUNTY, PENNSYLVANIA.
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 4A.
W75-10576

FLOOD PLAIN INFORMATION: FALLING CREEK, CHESTERFIELD COUNTY, VIRGINIA.
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 4A.
W75-10577

FLOOD PLAIN INFORMATION: JAMES RIVER, EAGLE ROCK TO LICK RUN, BOTETOURT COUNTY, VIRGINIA.
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 4A.
W75-10578

FLOOD PLAIN INFORMATION: JOHNSON CREEK AND TRIBUTARY, CHESTERFIELD COUNTY, VIRGINIA.
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 4A.
W75-10579

ENVIRONMENTAL ISSUES, EFFECTS, AND SOLUTIONS,
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 6G.
W75-10795

6G. Ecologic Impact Of Water Development

THEORETICAL AND APPLIED CONCEPTS OF WATER RESOURCES FOR SOCIAL WELFARE.
Auburn Univ., Alabama. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W75-10354

HARRY S. TRUMAN DAM AND RESERVOIR, OSAGE RIVER, MISSOURI, APENDIX A (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 8A.
W75-10363

MANUAL FOR PREPARATION OF ENVIRONMENTAL IMPACT STATEMENTS FOR WASTEWATER TREATMENT WORKS, FACILITIES PLANS, AND 208 AREAWIDE WASTE TREATMENT MANAGEMENT PLANS,
Environmental Protection Agency, Washington, D.C. Office of Federal Activities.
For primary bibliographic entry see Field 5D.
W75-10473

EFFECTS OF AN OFFSHORE CRUDE OIL UNLOADING TERMINAL ON THE MARINE ENVIRONMENT,
Texas A and M Univ., College Station. Environmental Engineering Div.
For primary bibliographic entry see Field 5C.
W75-10642

LAKE ERIE INTERNATIONAL JETPORT MODEL FEASIBILITY INVESTIGATION, PHYSICAL MODEL FEASIBILITY STUDY,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W75-10670

RIVERS IN THE CITY,
For primary bibliographic entry see Field 6B.
W75-10723

ENVIRONMENTAL ISSUES, EFFECTS, AND SOLUTIONS,
Soil Conservation Service, Washington, D.C.
L. A. Brown.
In: Agricultural and Urban Considerations In Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 511-528, 1974. 10 ref.

Descriptors: *Environmental effects, *Channel improvement, *Flood control, *Engineering structures, Environment, Environmental engineering, Project planning, Erosion control, Sediment control, Soil conservation, Economic justification, Costs, Project benefits, Trees, Wetlands, Drainage, Ecology, Hardwood, Streams, Water table.
Identifiers: Bottomland clearing.

Conservationists and environmentalists feel strongly that channel projects are in many cases unnecessarily damaging the natural amenities of streams and streamsides. Most frequent criticisms concern draining of wetlands, cutting off oxbows and meanders, clearing bottomland hardwoods, and altering water tables. Criticism has extended to the economic justification, formulation, and operation and maintenance of federally assisted projects. This concern is countered by the need to protect and improve the human environment, the quality of other natural resources, and our standard of living. Compromise between these values is essential if we are to maintain our standard of living and reasonably protect our environment. About 34,240 miles in 1630 federal or federally assisted projects have been modified or planned for modification by the Corps of Engineers and the Soil Conservation Service. Beginning largely with the National Environmental Policy Act of 1969, major changes began taking place in the formulation of federally assisted water development projects. Engineers can substantially minimize adverse environmental impacts by using imaginative designs. Cost sharing for nonstructural measures should be equated with those for structural measures to promote objective development in the best interest of the public. (See also W75-10769) (Sims-ISWS)
W75-10795

PROBLEMS OF WATER QUALITY MANAGEMENT IN WESTERN RIVER BASIN SYSTEMS,
California Univ., Los Angeles. Coll. of Engineering.
For primary bibliographic entry see Field 5G.
W75-10804

NUCLEAR POWER PLANT COOLING SYSTEM SELECTION,
Kaiser Engineers, Oakland, Calif.
For primary bibliographic entry see Field 6C.
W75-10822

7. RESOURCES DATA

7A. Network Design

HOURLY RAINFALL GENERATION FOR A NETWORK,
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 2B.
W75-10515

AN AUTOMATIC DATA ACQUISITION AND REDUCTION SYSTEM,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
R. A. Sommerfeld.
Research Note RM-260, April 1974. 4 p, 5 fig.

Descriptors: On-site data collection, Data processing, Instrumentation, Automation.
Identifiers: Data acquisition, Data reduction.

A system for recording and automatically reducing up to 41 channels slowly varying data has been designed. For recording, the data are multiplexed into a very slow speed, analog tape recorder. Playback can be done at speeds up to 1000 times as fast as the recording speed, using a 60 IPS tape playback unit. A digital clock provides time control and the data are digitized and punched onto paper tape at playback. The paper tape can then be used to input the data to conventional computer systems for various analysis and editing operations. The cost of the system is comparable to high reliability strip charts, for the same number of channels. Total system accuracy for input voltages in the ranges plus or minus 0.1 to plus or minus 10 v is plus or minus 0.3 percent. (Forest Service)
W75-10652

7B. Data Acquisition

MULTICHANNEL TOXICANT INJECTION SYSTEM FOR FLOW-THROUGH BIOASSAYS,
National Water Quality Lab., Duluth, Minn.
For primary bibliographic entry see Field 5A.
W75-10443

LABORATORY MEASUREMENT OF SURFACE TEMPERATURE FLUCTUATIONS INDUCED BY SMALL AMPLITUDE SURFACE WAVES,
TRW Systems Group, Redondo Beach, Calif. Engineering Sciences Lab.
For primary bibliographic entry see Field 2L.
W75-10505

MEASUREMENT OF HYDRAULIC CONDUCTIVITY OF PEATS,
Guelph Univ. (Ontario). Dept. of Botany and Genetics.
T. S. Dai, and J. H. Sparling.
Canadian Journal of Soil Science, Vol 53, No 1, p 21-26, 1973, Illus. (Fr. summ.).

Descriptors: *Hydraulic conductivity, *Peat, *Canada, Measurement, Darcys Law, Bogs, Fen, Piezometers, Piezometry.

The measurement of hydraulic conductivity of peats in a northeastern Ontario, Canada, peatland is described. Several sizes of piezometer were tested and revealed little effect on the hydraulic conductivity. Various lengths of piezometer chamber were used to measure both vertical and horizontal components of hydraulic conductivity at a number of sites. Open bog sites had a higher vertical component of hydraulic conductivity than the poor fen site. The poor fen site exhibited a greater dependence of the hydraulic conductivity on piezometer chamber length than the open bog site, indicating a greater horizontal component of the hydraulic conductivity. A significant correlation between the differential heads and hydraulic conductivity is demonstrated. This indicates a deviation of Darcian flow in the peatland. The ratios of differential heads in piezometer are constant however, and therefore the proportionality of Darcy's Law is exhibited by the piezometer method.--Copyright 1973, Biological Abstracts, Inc.
W75-10536

ERROR ANALYSIS OF DOBSON SPECTROPHOTOMETER MEASUREMENTS OF THE TOTAL ATMOSPHERIC OZONE CONTENT,
National Aeronautics and Space Administration, Wallops Island, Va. Wallops Station.
A. C. Holland, and R. W. L. Thomas.
Available from the National Technical Information Service, Springfield, Va 22161 as NASA TN D-7877, $3.75 in paper copy, $2.25 in microfiche. NASA Technical Note D-7877, March 1975. 29 p, 8 fig, 6 tab, 13 ref, 1 append.

Descriptors: *Ozone, *Measurement, *Spectrometers, *Radiation, Spectrophotometry, Model studies, Atmosphere, Absorption, Solar radiation, Monte Carlo method, Mathematical studies, Aerosols, Remote sensing.
Identifiers: *Dobson spectrophotometer, Error analysis.

The amount of ozone present in the earth's atmosphere is of considerable interest to the scientific community because of its role in the transfer of solar energy in the atmosphere, absorbing harmful ultraviolet radiation, and providing a source of thermal energy in the stratosphere. The Dobson spectrophotometer has served as a standard ground-based instrument for the measurement of total atmospheric ozone for over two decades. In order to assess the accuracy of the total ozone inferred from Dobson measurements a study was initiated several years ago. The first phase of that study concluded that single and multiple scattering can contribute significant errors to the amount of ozone inferred from direct sun measurements. This report described the second phase of the study which was concerned with the errors in the total ozone amount estimated from Dobson direct sun measurements for standard atmospheres ranging from tropical through subarctic conditions. (Sims-ISWS)
W75-10545

DEVICES FOR TOXICOLOGICAL LONG-TERM STUDIES ON AQUATIC ORGANISMS (GERATE ZUR DURCHFUHRUNG TOXIKOLOGISCHER LANGZEITSTUDIEN AN WASSERORGANISMEN),
Farbwerke Hoechst, Frankfurt am Main (West Germany).
For primary bibliographic entry see Field 5A.
W75-10618

ANALOG TEMPERATURE RECORDS FROM A LINEARIZED THERMISTOR NETWORK,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
R. A. Schmidt.
Research Note RM-286, May 1975. 4 p, 5 fig, 2 ref.

Descriptors: *Temperature, *Thermometer, *Air temperature, Instrumentation, Meteorology, Integrated circuits, Measurement, Networks.
Identifiers: Thermistor network, Analog temperature records.

To overcome the inherent disadvantage of nonlinear output, a system was developed consisting of a thermistor network and operational amplifiers to produce a linear analog temperature record, either on strip charts or magnetic tape. (Forest Service)
W75-10650

AUTOMATED SEQUENTIAL COMPOSITE SAMPLING. A NEW TECHNIQUE FOR WATER POLLUTION STUDY AND CONTROL,
N-Con Systems Co., Inc., Larchmont, N.Y.
For primary bibliographic entry see Field 5A.
W75-10690

A GRAVITY-FLOW COLUMN TO PROVIDE PESTICIDE-LADEN WATER FOR AQUATIC BIOASSAYS,
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Environmental Research Lab.
For primary bibliographic entry see Field 5A.
W75-10844

7C. Evaluation, Processing and Publication

REMOVAL OF PERIODICITIES BY DIFFERENCING AND MONTHYL MEAN SUBTRACTION,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 2A.
W75-10352

GENERAL ASPECTS OF MULTIVARIATE ANALYSIS WITH APPLICATIONS TO SOME PROBLEMS IN HYDROLOGY,
Agricultural Research Service, Chickasha, Okla.
For primary bibliographic entry see Field 2A.
W75-10510

DEVELOPING REGIONAL STOCHASTIC DATA BASES,
Iowa State Univ., Ames. Dept. of Economics.
For primary bibliographic entry see Field 2E.
W75-10528

A TWO-DISTRIBUTION METHOD FOR FITTING MIXED DISTRIBUTIONS IN HYDROLOGY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2E.
W75-10531

DAILY TEMPERATURE AND SALINITY OF SURFACE WATER OF PATUXENT RIVER AT SOLOMONS, MARYLAND, BASED ON 30 YEARS OF RECORDS (1938-1967),
Maryland Univ., Solomons. Chesapeake Biological Lab.
For primary bibliographic entry see Field 2E.
W75-10535

NONLINEAR CHANNEL ROUTING BY COMPUTER,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W75-10543

INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES.
National Oceanic and Atmospheric Administration, Rockville, Md.
For primary bibliographic entry see Field 2H.
W75-10547

INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES.
National Oceanic and Atmospheric Administration, Rockville, Md.
For primary bibliographic entry see Field 2H.
W75-10548

INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES.
National Oceanic and Atmospheric Administration, Rockville, Md.
For primary bibliographic entry see Field 2H.
W75-10549

PEDOLOGIC COVER OF THE WATERSHED OF THE PORECKA RIVER,
Institute for Soil Research, Belgrade (Yugoslavia).
For primary bibliographic entry see Field 2A.
W75-10551

FLOOD PLAIN INFORMATION: OUACHITA RIVER, HOT SPRINGS CREEK, STOKES CREEK, MOLLY CREEK, GULPHA CREEK, CITY OF HOT SPRINGS, ARKANSAS.
Army Engineer District, Vicksburg, Miss.
For primary bibliographic entry see Field 4A.
W75-10559

FLOOD PLAIN INFORMATION: BUSHKILL CREEK, VICINITY OF EASTON, PENNSYLVANIA.
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 4A.
W75-10560

FLOOD PLAIN INFORMATION: BLOOMSBURG, COLUMBIA COUNTY, PENNSYLVANIA-SUSQUEHANNA RIVER.
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 4A.
W75-10561

FLOOD PLAIN INFORMATION: BRANDYWINE CREEK, CHESTER COUNTY, PENNSYLVANIA.
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 4A.
W75-10562

FLOOD PLAIN INFORMATION: GOLDSMITH GULCH, DUTCH CREEK, LILLEY GULCH, AND COON CREEK, VOLUME VI, DENVER METROPOLITAN REGION, COLORADO.
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W75-10563

FLOOD PLAIN INFORMATION: MEADOW CREEK, ALBEMARLE COUNTY AND CHARLOTTESVILLE, VIRGINIA.
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 4A.
W75-10564

FLOOD PLAIN INFORMATION: MACON COUNTY, ILLINOIS.
Army Engineer District, Chicago, Ill.
For primary bibliographic entry see Field 4A.
W75-10565

FLOOD PLAIN INFORMATION: EAST FORK ONE HUNDRED AND TWO RIVER, BEDFORD, IOWA.
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 4A.
W75-10566

FLOOD PLAIN INFORMATION REPORT: SENECA CREEK, MONTGOMERY COUNTY, MARYLAND.
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 4A.
W75-10567

FLOOD PLAIN INFORMATION: MILL RUN, BLAIR COUNTY, PENNSYLVANIA.
Army Engineer District, Baltimore.
For primary bibliographic entry see Field 4A.
W75-10568

SPECIAL FLOOD HAZARD INFORMATION REPORT: CHICKASAWHAY RIVER, WAYNESBORO, WAYNE COUNTY, MISSISSIPPI.
Army Engineer District, Mobile, Ala.
For primary bibliographic entry see Field 4A.
W75-10569

FLOOD PLAIN INFORMATION: BROOKINGS, BROOKINGS COUNTY, SOUTH DAKOTA, VOLUME I - DEER CREEK.
Army Engineer District, Omaha, Neb.
For primary bibliographic entry see Field 4A.
W75-10570

FLOOD PLAIN INFORMATION: WHITE CLAY CREEK, NEW CASTLE COUNTY, DELAWARE.
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 4A.
W75-10571

FLOOD PLAIN INFORMATION: SHABAKUNK CREEK, WEST BRANCH SHABAKUNK AND LITTLE SHABAKUNK CREEKS, MERCER COUNTY, NEW JERSEY.
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 4A.
W75-10572

FLOOD PLAIN INFORMATION: CATOMA CREEK, VICINITY OF MONTGOMERY, ALABAMA.
Army Engineer District, Mobile, Ala.
For primary bibliographic entry see Field 4A.
W75-10574

FLOOD PLAIN INFORMATION: UPPER RIVER ROUGE, MINNOW POND DRAIN, BELL BRANCH AND TARABUSI CREEK, WAYNE AND OAKLAND COUNTIES, MICHIGAN.
Army Engineer District, Detroit, Mich.
For primary bibliographic entry see Field 4A.
W75-10575

FLOOD PLAIN INFORMATION: WEST BRANCH SUSQUEHANNA RIVER, LYCOMING COUNTY, PENNSYLVANIA.
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 4A.
W75-10576

FLOOD PLAIN INFORMATION: FALLING CREEK, CHESTERFIELD COUNTY, VIRGINIA.
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 4A.
W75-10577

FLOOD PLAIN INFORMATION: JAMES RIVER, EAGLE ROCK TO LICK RUN, BOTETOURT COUNTY, VIRGINIA.
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 4A.
W75-10578

FLOOD PLAIN INFORMATION: JOHNSON CREEK AND TRIBUTARY, CHESTERFIELD COUNTY, VIRGINIA.
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 4A.
W75-10579

FLOOD HAZARDS IN THE SEATTLE-TACOMA URBAN COMPLEX AND ADJACENT AREAS, WASHINGTON,
Geological Survey, Tacoma, Wash.
B. L. Foxworthy, and E. G. Nassar.
Open-file report (Basic-data contribution 5), 1975. 1 sheet, 2 fig, 11 ref.

Descriptors: *Floods, *Flood damage, *Flood control, *Washington, Streamflow, Runoff, Maps, Snowmelt, Mudflows, Glaciers, Volcanoes, Hydrologic data, Evaluation, Planning, Urban hydrology.
Identifiers: *Flood hazards, *Seattle-Tacoma area(Wash), Coastal flooding.

This one-sheet atlas of the Seattle-Tacoma urban area, Washington, Briefly describes flood hazards, including some that may be unique to the Puget Sound basin; indicates the parts of the area for which flood-hazard data are available; and lists the main sources of hydrologic information that is useful for flood-hazard analysis in conjunction with long-range planning. By far the most common type of flooding in the Pudget Sound basin is that caused by excessive runoff from storm precipitation, often augmented by melting of snow. This is the type of flooding to which most of the existing flood-hazard data pertain. As the floodwaters rise and spread farther across the flood plain, increasingly larger floodflows can be accommodated with only small additional rises in water levels. Accordingly, a flood having a recurrence interval of 100 years may not inundate much more land than a flood of 50-year recurrence interval. The relative flood stages of a typical, unregulated stream are shown diagrammaticall. (Woodard-USGS)
W75-10580

GROUND-WATER LEVELS IN NEW MEXICO, 1972,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 4B.
W75-10582

INDEX TO WATER RESOURCES DATA FOR LOUISIANA: SURFACE WATER RECORDS; WATER-QUALITY RECORDS.
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 5A.
W75-10590

HYDROGEOLOGIC DATA FOR THE FARMINGTON RIVER BASIN, CONNECTICUT,
Geological Survey, Hartford, Conn.
H. T. Hopkins, and E. H. Handman.
Connecticut Water Resources Bulletin No 28, 1975. 49 p, 1 fig, 1 plate, 5 tab, 9 ref.

Descriptors: *Hydrologic data, *Groundwater resources, *Basic data collections, *Test wells, *Connecticut, Massachusetts, Water wells, Drilling, Well data, Water levels, Pumping, Water yield, Drawdown, Observation wells, Drillers logs, Aquifer characteristics, Geology, Water utilization.
Identifiers: *Farmington River basin(Conn).

Hydrologic and geologic data were collected and compiled by the U.S. Geological Survey in cooperation with the Connecticut Department of Environmental Protection as part of a water resources investigation of the Farmington River basin, Connecticut. The Farmington River drains a 601-square-mile area in southwestern Massachusetts and north-central Connecticut. As defined for this report the Farmington River basin is restricted to 416 square miles in Connecticut. Some supporting data were collected in Massachusetts. The study area includes all or parts of the following towns: Avon, Barkhamsted, Bristol, Burlington, Canton, Colebrook, East Granby, Farmington, Granby, Hartland, Harwinton, New Hartford, Norfolk, Plainville, Plymouth, Simsbury, Suffield, Torrington, Winchester, and Wolcott. Data were collected from July 1970 to December 1972 and are supplemented by data collected during previous investigations. Fifty-three test holes were augered in areas of stratified drift. Logs are tabulated for these test holes and sieve analyses are shown for samples collected from selected holes. (Woodard-USGS)
W75-10591

HYDROLOGICAL DATA FROM WELLS IN SOUTHWEST HILLSBOROUGH COUNTY, FLORIDA, 1950-74,
Geological Survey, Tallahassee, Fla.
A. D. Duerr.
Open-file report FL 74031, 1975. 53 p, 3 fig, 4 tab, 5 ref.

Descriptors: *Hydrologic data, *Water wells, *Florida, *Basic data collections, Water levels, Water quality, Chemical analysis, Well data.
Identifiers: *Southwest Hillsborough County(Fla).

A study of the water resources of southwest Hillsborough County, Fla., was made during 1971-74 to determine the hydrologic effects of groundwater withdrawals on water levels and water quality in a coastal area undergoing rapid urbanization. The study area includes about 200 square miles of southwest Hillsborough County adjacent to Tampa Bay and Manatee County. Data from 258 wells tapping the artesian aquifers include tables of well records, water-level measurements, and water-quality analyses of samples collected. In addition, earlier data published by Peek (1959) and Menke, Meredith, and Wetterhall (1961 and 1964) are included to show water-level and water-quality changes in selected wells over a 20-year period. (Woodard-USGS)
W75-10593

MAP OF THE ANTELOPE VALLEY-EAST KERN WATER AGENCY AREA, CALIFORNIA, SHOWING GROUND-WATER SUBUNITS AND AREAS, LOCATION OF WELLS, AND WATER-LEVEL CONTOURS FOR SPRING 1974,
Geological Survey, Menlo Park, Calif.
J. H. Koehler.
Open-file map, 1974. 1 sheet, 1 map.

Descriptors: *Maps, *Water levels, *Groundwater, *Water wells, *California, Contours, Sites, Stations, Aquifers, Groundwater basins.
Identifiers: *Antelope Valley area(Calif).

This map, scale 1/2 inch equals approximately 1 mile, of the Antelope Valley -- East Kern Water Agency Area, California, shows groundwater subunits and areas, location of wells, and water-level contours for spring 1974. Well locations for monitoring water-quality changes also are shown. (Woodard-USGS)
W75-10595

HYDROLOGIC DATA FOR URBAN STUDIES IN THE FORT WORTH, TEXAS METROPOLITAN AREA, 1973,
Geological Survey, Austin, Tex.
B. B. Hampton.

Open-file report, May 1975. 129 p, 3 fig, 5 tab.

Descriptors: *Hydrologic data, *Urban hydrology, *Floods, *Urbanization, *Texas, Flood frequency, Flood peak, Flood profiles, Data collections, Rainfall, Runoff, Storms, Evaluation, Mass curves, Hydrographs.
Identifiers: *Fort Worth(Tex).

In October 1968, the Geological Survey in cooperation with the city of Fort Worth Department of Public Works began a program of hydrologic investigations on several small streams in Fort Worth, Tex. The investigations are designed to evaluate factors affecting floods on small streams in the metropolitan area. Studies of additional streams, one of which drains beneath the impervious area of a shopping center, were added to the program in October 1969. The objectives of the program are: (1) To determine, on the basis of historical data and hydrologic analyses, the magnitude and frequency of floods; (2) to document and define the areal extent of floods of greater than ordinary magnitude; and (3) to determine the effect of urban development on flood peaks and volume. Basic hydrologic data collected in four study areas during the 1973 water year (October 1, 1972-September 30, 1973) are presented. The four study areas are Sycamore Creek, Sycamore Creek tributary, Dry Branch, and Little Fossil Creek. The Sycamore Creek tributary study area includes the highly impervious area of the Seminary South Shopping Center as a subarea. (Woodard-USGS)
W75-10596

A PREDICTIVE COMPUTER MODEL OF THE LOWER CRETACEOUS AQUIFER, FRANKLIN AREA, SOUTHEASTERN VIRGINIA,
Geological Survey, Richmond, Va.
For primary bibliographic entry see Field 2F.
W75-10599

TEMPERATURES OF WYOMING STREAMS,
Geological Survey, Cheyenne, Wyo.
H. W. Lowham, J. E. Kircher, and F. C. Boner.
Wyoming State Water Planning Program, Cheyenne, Report No 15, July 1975. 114 p, 2 fig, 6 ref.

Descriptors: *Water temperature, *Basic data collections, *Streams, *Wyoming, Gaging stations, Sites, Measurement.

These data were assembled in response to a growing need for baseline information concerning water temperatures of Wyoming streams. Water temperatures are important to many water users. Beginning in about 1950, observations of water temperature in Wyoming were obtained whenever discharge measurements were made by the U.S. Geological Survey. Most of these temperature observations have never been published. Previously unpublished data are presented in graphical form for 207 streamflow stations. (Woodard-USGS)
W75-10604

GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1975,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 2F.
W75-10606

FLOOD WAVES AND SUSPENDED SEDIMENT PULSES IN URBANIZED CATCHMENTS,
University of New England, Armidale (Australia). Dept. of Geography.
For primary bibliographic entry see Field 4C.
W75-10647

AN AUTOMATIC DATA ACQUISITION AND REDUCTION SYSTEM,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 7A.
W75-10652

ANALYSIS OF A LARGE WATER DISTRIBUTION SYSTEM USING ADVANCED COMPUTER SOFTWARE,
Orlando Utilities Commission, Fla.
For primary bibliographic entry see Field 4A.
W75-10720

COMPUTER SIMULATION OF WATER DISTRIBUTION NETWORKS,
Boeing Computer Services, Inc., Seattle, Wash. Mathematicals and Modeling Unit.
For primary bibliographic entry see Field 4A.
W75-10823

PIPELINE STRESS ANALYSIS,
Tulsa Univ., Okla.
For primary bibliographic entry see Field 8B.
W75-10824

8. ENGINEERING WORKS

8A. Structures

HARRY S. TRUMAN DAM AND RESERVOIR, OSAGE RIVER, MISSOURI, APENDIX A (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.
Available from the National Technical Information Service, Springfield, Va. 22161, as USDC, EIS-MO-73-1931-F, $10.50 in paper copy, $2.25 in microfiche. December 12, 1973. 403 p, 86 tab.

Descriptors: *Environmental effects, *Missouri, *Concrete dams, *Reservoir construction, Dam construction, Dams, Damsites, Flood control, Recreation, Electric power, Hydroelectric power, Wildlife habitats, Reservoirs, Detention reservoirs, Multiple-purpose reservoirs, Rivers, Water management(Applied), Wildlife.
Identifiers: *Environemtnal Impact Statements, Dam effects, Osage River(MO).

This material consists of Appendix A, as ordered by the Court, to supplement the final environmental statement regarding the Harry S. Truman Dam and Reservoir Project located on the Osage River in Missouri. Pursuant to the order of the United States District Court, Western District of Missouri, Western Division, the following items are included in this appendix: the memoradum opinion, findings of fact, conclusions of law, and final judgment and decree of the court. Also included are plaintiffs' exhibits one through ten, inclusive, and portions of the other exhibits to which plaintiffs made reference in the proposed findings of fact as admitted in evidence, as well as the statement of findigns by the district engineer. (Fernandez-Florida)
W75-10363

FLUID-DYNAMIC EXCITATION INVOLVING FLOW INSTABILITY,
Toronto Univ. (Ontario). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 8B.
W75-10544

A NUMERICAL MODEL FOR PREDICTING THE EFFECTS OF LANDSLIDE-GENERATED WATER WAVES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
D. C. Raney, and H. L. Butler.
Available from the National Technical Information Service, Springfield, Va 22161. Research Report H-75-1, February 1975. 42 p, 8 fig, 1 tab, 5 photo, 5 pl, 3 append, 12 ref.

Descriptors: *Landslides, *Mathematical models, *Reservoirs, Forecasting, *Model studies.
Identifiers: *Water wave generation.

A numerical model for the generation and propagation of landslide-generated water waves in reservoirs is developed. Only two-dimensional hydrodynamic quantities are obtained from the program; however, a pseudo three-dimensional effect is present since the three-dimensional geometry of an actual reservoir can be represented. The model provides an approach to the evaluation of the first wave crest that may result from potential landslide regions located on reservoirs. Arbitrary landslide volumes, reservoir depths, slide propagation velocity, slide shape, and initial and final location of the slide can be considered. The numerical results have been compared with experimental results obtained on a 1:120 undistorted scale model of Libby Dam and Lake Koocanusa in Montana. The numerical results for the height of the first wave crest and its time of arrival at various points in the reservoir are in good agreement with the experimentally measured values from the hydraulic model. Appendix A gives data requirements for the numerical model; Appendix B is an analysis of viscous drag and pressure drag coefficients; and Appendix C lists and defines symbols used in this report. (WES)
W75-10661

STOCKHOLM PUTS SEWAGE PLANTS UNDERGROUND,
Stockholm Municipal Services Dept. (Sweden). Div. of Treatment Plant Design.
For primary bibliographic entry see Field 5D.
W75-10718

THE PERIMETER CANAL - A NEW APPROACH TO DISCHARGE URBAN WATER INTO A COASTAL MANGROVE AREA,
Greiner (J.E.) Co., Inc., Tampa, Fla.
For primary bibliographic entry see Field 4A.
W75-10773

SOME FACTORS AFFECTING CONTROL OF FLOW IN A LARGE CANAL SYSTEM,
California Univ., Davis. Hydraulics Lab.
For primary bibliographic entry see Field 8B.
W75-10786

EFFECTS OF SURFACE DRAINAGE ON STREAM FLOW,
Conservation Service, Temple, Tex.
For primary bibliographic entry see Field 4A.
W75-10794

PRINCIPLES OF ESTABLISHING SEWER SYSTEMS IN THE RURAL SETTLEMENTS OF MAGDEBURG COUNTY (GRUNDLAGEN FUER DIE ABWASSER-TECHNISCHE ERSCHLIESSUNG VON LANDGEMEINDEN IM BEZIRK MAGDEBURG),
For primary bibliographic entry see Field 5D.
W75-10833

8B. Hydraulics

NONLINEAR CHANNEL ROUTING BY COMPUTER,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W75-10543

FLUID-DYNAMIC EXCITATION INVOLVING FLOW INSTABILITY,
Toronto Univ. (Ontario). Dept. of Mechanical Engineering.

W. W. Martin, E. Naudascher, and M. Padmanabhan.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 101, No HY6, Proceedings Paper 11361, p 681-698, June 1975. 13 fig, 18 ref, append.

Descriptors: *Vibrations, *Stability, *Fluid mechanics, Hydraulics, Gates, Pressure, Flow friction, Shear stress, Flow separation, Boundary layers, Hydraulic structures, Shear, Flow, Stress.
Identifiers: Feedback, Excitation.

Most flow-induced structural vibrations can be traced to shear-layer instability. They are generated by feedback mechanisms through which disturbances to the free shear layer are self-generated and amplified with an inherent dominant frequency. Pressure fluctuations are produced over any portion of the body surface near the free shear layer. The range of flow conditions within which such vibrations may occur for given mechanical and geometrical properties of the structure was predicted by means of a kinematic analysis based on some results of stability theory and experiments. Verification of the validity of the analysis was provided by a comparison with tests for a typical hydraulic structure: a high-head gate with downstream lip. The results gave support to the general applicability of this method for the determination of flow conditions under which structural vibrations can be excited. (Lee-ISWS)
W75-10544

HYDRAULICS AND MECHANICS OF RIVER ICE JAMS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
M. S. Uzuner, and J. F. Kennedy.
IIHR Report 161, May 1974. 158 p, 39 fig, 3 tab, 33 ref, 3 append. Army Contract DAC25-73-C-0032, NSF Grant GK-35918X1.

Descriptors: *Mathematical models, *Ice jams, *Rivers, *Fluid mechanics, *Mechanical properties, Hydraulics, Laboratory tests, Equations, Ice, Winter, Velocity, Depth, Froude number, Strength, Failure(Mechanics), Ice cover.

An analytical model was developed for evolution of ice jams in rivers. The analysis was limited to the case of uniform, rectangular channels. It yielded predictions for the streamwise distribution of the thickness of the ice cover and the depth of flow beneath it, the flow depth at the upstream end of the jam, and the velocity of propagation of the jam front. Estimates were obtained for the rate of growth of a jam during early stages of its evolution. The formulation of the force equilibrium for the cover included relations for the compressive and shear strengths of floating fragmented ice, based on a failure analysis of the material. Experiments were conducted to determine the compressive strength, and Merino's experimental results were used to determine the shear strength. A computer program for solution of the governing equations was presented, and a specific example was solved to illustrate application of the mathematical model. The mode of thickening of jams was determined by analyzing the incipient motion of ice blocks resting beneath a jam. It was concluded that jams thicken primarily by internal collapse rather than by transport of floes beneath the floating cover. (Adams-ISWS)
W75-10556

ICINGS ALONG THE TRANS-ALASKA PIPELINE ROUTE,
Geological Survey, Anchorage, Alaska.
For primary bibliographic entry see Field 2C.
W75-10592

CHANNEL EROSION SURVEYS ALONG SOUTHERN SEGMENT OF THE TAPS ROUTE, ALASKA, 1972 AND 1973,
Geological Survey, Anchorage, Alaska.
J. M. Childers.
Open-file report (basic data), 1975. 57 p, 34 fig, 1 tab, 9 ref.

Descriptors: *Surveys, *Channel erosion, *Pipelines, *Oil, *Alaska, Baseline studies, Construction, Bank erosion, Sediment control, Streambeds, Scour, Ice, Floods, Planning, Evaluation.
Identifiers: *Trans-Alaska Pipeline System, *Taps route(Alaska), Flood Creek, Valdez(Alaska).

Preconstruction conditions are described at selected stream-channel sites along the southern segment of the Trans-Alaska Pipeline System from Flood Creek to Valdez. The information can be used in studies of severe channel erosion, streambed scour, bank erosion, or rechannelization. A plan is presented for detecting and measuring significant erosion and the important factors causing the erosion, such as flood discharge, icing development, and construction activities. (Woodard-USGS)
W75-10594

NORTON POINT DIKE STUDY, CONEY ISLAND, NEW YORK; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
R. F. Athow, Jr., R. A. Sager, and W. H. Bobb.
Available from the National Technical Information Service, Springfield, Va 22161. Miscellaneous Paper H-75-2, April 1975. 267 p, 6 fig, 26 tab, 26 photo, 176 pl, 3 ref.

Descriptors: *Hydraulic models, *Salinity, *Dye dispersion, *Dikes, *New York, Model studies, Tidal waters.
Identifiers: *Deflection dikes, Coney Island Beach(NY), *Current velocity, *Norton Point Dike(NY), *Tidal currents.

An existing comprehensive physical model that correctly reproduced tides, tidal currents, and density currents throughout the entire New York Harbor was used to determine the effects of constructing a current deflection dike at Norton Point, Coney Island, New York. The study included tests in the model to define the effects of the dike on tidal heights, current velocities, surface current patterns, salinities, and the distribution of dye from four sources throughout the New York Harbor complex. Based on results of the model tests, it was shown that the Norton Point dike would have the following effects in the study area: (a) local current patterns would be changed and a continuous east-west current would be set up along the Coney Island beaches, (b) tidal heights and tidal phasing as well as the salinity regime would not be affected significantly, (c) sediment buildup behind the dike would be encouraged. (d) very little flushing of the waters behind the dike would occur in the period while the area is being filled by the littoral drift, and (e) concentration of pollution from the Passaic Valley Outfall showed a slight net decrease at low-water slack along Coney Island, but a significant net increase at high-water slack. (WES)
W75-10662

WAIMANO STREAM FLOOD CONTROL PROJECT, PEARL CITY, HAWAII; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
P. E. Saunders.
Available from the National Technical Information Service, Springfield, Va 22161 as AD/A-006 020, $4.25 in paper copy, $2.25 in microfiche. Technical Report H-75-3, January 1975. 52 p, 3 fig, 9 photo, 14 pl, 2 append.

Descriptors: *Flood control, *Hydraulic models, *Open channel flow, Model studies, *Hawaii.
Identifiers: *High velocity flow, Pearl City(HI), *Waimano Stream (HI).

Tests were conducted on an undistorted, 1:20-scale physical model of the high-velocity channel for Waimano Stream to determine the adequacy of the sinuous channel to pass discharges as large as 6300 cfs. Since right-of-way limitations prevented major realignment of the proposed channel, superelevated curves were more severe than those recommended by current design guidance. The entering transition section was modified to improve flow conditions. Also, the superelevation was increased and the curve modified in several locations to improve flow distribution. The Moanalua Road drains were modified to improve flow conditions at their confluence with the main channel and the entrances to the relief drain and the diversion channel were modified to facilitate passage of the required flows. (WES)
W75-10663

LOS ANGELES AND LONG BEACH HARBORS MODEL STUDY; REPORT 2, OBSERVATIONS OF SHIP MOORING AND MOVEMENT,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
L. G. Crosby, and D. L. Durham.
Available from the National Technical Information Service, Springfield, Va 22161 as AD/A-005 149, $5.75 in paper copy, $2.25 in microfiche. Technical Report H-75-4, January 1975 (Report 2 of a series). 189 p, 5 fig, 12 tab.

Descriptors: *Mathematical models, *Model studies, *California, Ships, Harbors.
Identifiers: *Long Beach Harbor(Cal), *Los Angeles Harbor(Cal), *Mooring, Ship motion.

From March 1971 to July 1972, records of reported ship movements for four locations in Los Angeles and Long Beach Harbors were collected and maintained by the U.S. Army Engineer District, Los Angeles, and numerically coded onto computer cards. These cards were transmitted to the U.S. Army Engineer Waterways Experiment Station where they were computer analyzed and arranged into tables reporting mooring configurations and ship motion activity, which are presented in this report. The mooring information is to be used in analyzing and correlating ship motion with prototype wave data collected during the same study period as discussed in Report 1 of this series. Results of wave data analyses and correlations with ship motion will be presented in future reports of this series. (WES)
W75-10664

SPILLWAY FOR BURNSVILLE DAM, LITTLE KANAWHA RIVER, WEST VIRGINIA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
B. P. Fletcher.
Available from National Technical Information Service, Springfield, Va 22161 as AD/A-008 372, $4.25 in paper copy, $2.25 in microfiche. Technical Report H-75-5, March 1975. 58 p, 10 fig, 2 tab, 9 photo, 19 pl.

Descriptors: *Open channel flow, *Outlet works, *Spillways, *Stilling basins, Hydraulic models, Model studies, *West Virginia, Concretes, Spillway gates.
Identifiers: *Burnsville Lake(WV), Little Kanawha River(WV).

The concrete gravity ogee spillway for the Burnsville Dam will contain three 42-ft-wide gate bays separated by 8-ft-wide piers. Outlet works consisting of five low-level and three water-quality sluices will discharge on the downstream slope of the spillway. A hydraulic-jump type stilling basin will provide satisfactory dissipation of the energy of the spillway and sluice flows. A 1:40-scale model of the spillway, sluices, stilling basin, approach area, and exit channel was used to study the overall hydraulic performance of the structure. Tests indicated that flow conditions in the ap-

proach to the spillway with both uncontrolled and controlled flows were satisfactory for the full range of anticipated discharges. The stilling basin performed satisfactorily for spillway flows, and the only structural modification recommended was the elimination of the wing walls at the end of the basin. Operation of the right water-quality sluice simultaneously with the five low-level sluices resulted in satisfactory stilling basin performance. The size and extent of the stone protection required on the dam embankment, side slopes of the exit channel, Fisherman's Bridge, and Fisherman's Weir were determined by model investigations. (WES)
W75-10665

TURBULENT FLOW IN RECTANGULAR OUTLET CONDUIT, REND LAKE DAM, BIG MUDDY RIVER, ILLINOIS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
C. A. Pugh.
Available from the National Technical Information Service, Springfield, Va 22161 as AD/A-005 150, $3.75 in paper copy, $2.25 in microfiche. Technical Report H-75-2, January 1975. 33 p, 9 fig, 1 tab, 9 pl, 7 ref.

Descriptors: *Conduits, *Outlet works, *Turbulent flow, *Illinois.
Identifiers: *Rend Lake Dam(Ill), Big Muddy River(Ill).

Tests were conducted in a 4- by 6-ft concrete conduit at Rend Lake Dam, Big Muddy River, Illinois, in September 1973 to investigate turbulent flow characteristics in a rectangular conduit on a full scale and to provide data for future design work. Two cantilevered velocity probes were used to measure horizontal velocity profiles at 6 points along the inlet region. Piezometric head was measured with embedded piezometers at 12 points along the entire length of the conduit. Average velocity of flow in the conduit was 27 ft/sec, and the average Reynolds number was 1.25 x 10 to the 7th power. Velocity distributions in the boundary layer were in good agreement with a log-linear velocity profile equation. The coefficients in the velocity profile equations and the shear stress become constant at X/D approximately equal to 20. Equivalent sand grain roughness values were about the same as those determined by other investigators for circular conduits of comparable size and construction. (WES)
W75-10666

NAVIGATION CONDITIONS AT CANNELTON LOCKS AND DAM, OHIO RIVER; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
J. J. Franco, and C. D. McKellar.
Available from National Technical Information Service, Springfield, Va 22161 as AD/A009 489, $5.25 in paper copy, $2.25 in microfiche. Technical Report H-75-6, April 1975. 114 p, 3 fig, 9 tab, 6 photo, 55 pl.

Descriptors: *Ohio River, *Locks, *Dams, Powerplants, Flow, Channels, Ice, Discharge(Water), Overflow, Spillways, Gates, *Hydraulic models, Model studies, *Indiana, *Navigation.
Identifiers: *Cannelton Locks and Dam(Ind).

Cannelton Locks and Dam, proposed for construction on the Ohio River, will replace existing Locks and Dams 43-45. The project comprises two locks with clear chamber dimensions of 110 by 600 ft and 110 by 1200 ft and a 1365-ft-long, gated, non-navigable dam, with provisions for powerhouse facilities at the left end of the dam. An undistorted, 1:120-scale model reproducing 8 miles of the Ohio River, the locks and dam structures, the hydropower plant, and other structures that affect flow conditions was used for the investigation. The principal results of this investigation indicate the following: (a) Velocities along the lock side of the channel will tend to be high. (b) Ice and debris will tend to move along the lock side of the river, with the concentration on that side increasing as the river discharge increases. (c) Orientation of the powerhouse and tailrace can affect navigation conditions in the lower lock approach. (d) Satisfactory navigation conditions can be developed over the overflow section between the spillway and powerhouse with some excavation along the left overbank upstream of the powerhouse intake channel. (e) The head on the lower lock gate at the end of lock emptying can be as much as 0.6 ft, depending on velocities along the lock side of the channel. Proposed solutions to these problems are presented. (WES)
W75-10667

FLOOD CONTROL PROJECT ON LYTLE AND WARM CREEKS AND SANTA ANA RIVER, CALIFORNIA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
J. H. Ables, Jr., and G. A. Pickering.
Available from the National Technical Information Service, Springfield, Va 22161 as AD/A-009 493, $4.25 in paper copy, $2.25 in microfiche. Technical Report H-75-7, April 1975. 72 p, 13 fig, 3 tab, 17 photo, 21 pl.

Descriptors: *Flood control, *Flood flow, Levees, Streambeds, Energy dissipation, Bridges, *Hydraulic models, Flow, Riprap, Sediment transport, Design flow, *California, Model studies.
Identifiers: Lytle Creek(Cal), Warm Creek(Cal), *Santa Ana River(Cal), San Bernando(Cal), Grade control structures, Concrete channel, Confluences.

The Lytle and Warm Creeks and Santa Ana River project will provide another important unit under the general comprehensive plan for flood control in San Bernardino County, California. The proposed plan for containing the flood flows will consist of raising levees, excavating streambeds, and constructing grade control structures, energy dissipators, bridges, and several thousand feet of high-velocity concrete channel. The investigation was conducted on a 1:60-scale model with the existing and proposed bridges, concrete channels, and natural streambed channels with revetted slopes reproduced in the model. Tests were concerned with flow conditions, water-surface elevations, rip-rap stability, and sediment transport at the grade control structures, bridges, confluences, and energy dissipators. Tests revealed the flow conditions produced by the original design exposed rock energy dissipators in Santa Ana River and Warm Creek were unsatisfactory. Baffle block energy dissipators that were then developed for these areas resulted in satisfactory flow conditions with the design flow. (WES)
W75-10668

EVALUATION OF DISPOSAL AREAS IN JAMES RIVER; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
R. A. Boland, Jr., and W. H. Bobb.
Available from the National Technical Information Service, Springfield, Va 22161. Miscellaneous Paper H-75-1, January 1975. 39 p, 3 fig, 3 tab, 11 photo.

Descriptors: *Hydraulic models, *Sediment control, *Waste disposal, *Virginia, Model studies, Evaluation, Dredging, Sediments, Water pollution sources.
Identifiers: Dredged material, *James River(VA), Waste disposal sites.

The existing comprehensive fixed-bed model of James River (VA) was used to study the major disposal areas used during maintenance dredging operations for the existing 25-ft-deep navigation channel to determine if the disposal areas are performing satisfactorily in terms of retaining dredged material placed therein. The tests consisted of the release of lightweight sediments at surface depth in the disposal areas, tracing patterns of movement of material from the areas, and defining areas where these sediments would probably deposit. The results indicated that, in general, the disposal areas and operating procedures presently employed are satisfactory with respect to areas of material deposition and material retention characteristics. (WES)
W75-10669

LAKE ERIE INTERNATIONAL JETPORT MODEL FEASIBILITY INVESTIGATION, PHYSICAL MODEL FEASIBILITY STUDY,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
D. G. Outlaw, D. L. Durham, D. D. Davidson, and R. W. Whalin.
Available from the National Technical Information Service, Springfield, Va 22161 as AD/A-009 729, $5.25 in paper copy, $2.25 in microfiche. Technical Report H-74-6, April 1975. 114 p, 21 fig, 8 tab, 20 pl, 3 append, 24 ref.

Descriptors: *Hydraulic models, *Feasibility studies, *Lake Erie, *Airports, Breakwaters, *Waves(Water), Littoral drift, Seiches, Standing waves, *Lakes, *Model studies, *Ohio.
Identifiers: Mass circulation, Wave action, Rotating circulation, Cleveland(Ohio).

This report presents the conclusions and recommendations of the U.S. Army Engineer Waterways Experiment Station's study of the feasibility of using physical hydraulic models to estimate the effects of the proposed Lake Erie International Jetport on lake hydrodynamics. The physical models considered in the study are mass circulation, wave action, breakwater stability, and longshore littoral transport models. Specific models are recommended for investigation of the modification of wave conditions along the shore due to the jetport and for evaluation of breakwater stability. However, a specific physical model for investigation for mass circulation is not recommended prior to the completion of a numerical circulation study, another task in the model feasibility study. A non-rotating standing wave model of the lake is recommended, again dependent on the results of the numerical circulation model, for investigation of seiche currents near the jetport. A small-scale pilot model is recommended to optimize construction and operating techniques for both rotating circulation and standing wave models. (WES)
W75-10670

WATER WORKS IMPROVEMENTS--SPRINGFIELD, VERMONT,
Dvfresne-Henry Engineering Corp., North Springfield, Vt.
For primary bibliographic entry see Field 3D.
W75-10713

AGRICULTURAL AND URBAN CONSIDERATIONS IN IRRIGATION AND DRAINAGE.
American Society of Civil Engineers, New York.
For primary bibliographic entry see Field 4A.
W75-10769

A CRITERION FOR VEGETATION STIFFNESS,
Waterloo Univ. (Ontario). Dept. of Civil (Engineering.
For primary bibliographic entry see Field 4A.
W75-10782

SOME FACTORS AFFECTING CONTROL OF FLOW IN A LARGE CANAL SYSTEM,
California Univ., Davis. Hydraulics Lab.
J. J. DeVries, and J. Amorocho.

In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 329-352, 1974. 15 fig, 5 ref, 2 append.

Descriptors: *Hydraulic stuctures, *Canals, *Aqueducts, *California, Unsteady flow, Waves(Water), Ckeck structures, Winds, Wind tides, Seiches, Surges, Canal design, Automatic control, Hydraulic transients, Water delivery.
Identifiers: *California Water Project.

The California Aqueduct is the main water delivery facility of the California Water Project. In planning and designing the system, an unprecedented job was done in considering the various requirements and possible problems. But the size of the project and unusual meteorological conditions have given rise to unforeseen operational problems, including wind problems, hydraulic transients, and instabilities in automatic controller operations. Studies made on the North San Joaquin Division of the aqueduct point to possible solutions. Results of this work were discussed. (See also W75-10769) (Jess-ISWS)
W75-10786

CURRENT WATER SYSTEMS AUTOMATION RESEARCH AND DEVELOPMENT IN THE BUREAU OF RECLAMATION,
Bureau of Reclamation, Denver, Colo.
For primary bibliographic entry see Field 8C.
W75-10787

ART OF AGRICULTURAL DRAINAGE DESIGN AND COSTS,
Wright Water Engineers, Inc., Denver, Colo.
For primary bibliographic entry see Field 4A.
W75-10797

PIPELINE STRESS ANALYSIS,
Tulsa Univ., Okla.
J. J. Azar, J. G. Bomba, and V. G. Randolph.
Transportation Engineering Journal, American Society of Civil Engineers, Vol 101, No TE1, Proceedings paper No 11122, p 163-170, February 1975. 4 fig, 1 tab, 10 ref.

Descriptors: *Pipelines, *Transportation, *Computer programs, *Stress analysis, *Computer models, Structural analysis, Oceans, Depth, Simulation analysis, Equations, Evaluation, Effects, Systems analysis, Behavior, Finite element analysis, Model studies.
Identifiers: Underwater pipelines, Matrix methods(Structural), Displacement, Nonlinear programming, Offshore structures, Loadings, Stinger geometry.

Pipelines are economical and practical means for transporting oil and gas in marine environments. Unless there exist reliable solution techniques to warrant the structural integrity during installation, however, the cost of structural failure could be very high. The finite element displacement method in conjunction with the 'incremental piece-wise linear procedure' is used to predict marine pipeline stresses and their geometrically nonlinear displacements. A computer model, the Offshore Pipeline Static Stress model, provides an advanced tool to simulate and analyze stresses induced on pipelines during laying operations as well as on pipelines in place. The program is designed to compute the reactions and stresses due to concentrated loadings. It allows easy evaluation of the effects of the various externally applied loadings combined with the various stinger geometry configurations on the pipe structural behavior. The program is multipurpose and is applicable and accurate for a wide range of offshore/onshore structural problems. Its flexibilities include two and three-dimensional modes, and linear and nonlinear modes. The ocean depth, pipeline dimensions, and the stinger geometry place no restrictions on the applicability of the developed model. (Bell-Cornell)
W75-10824

8C. Hydraulic Machinery

CIVIL ENGINEERING LABORATORY DEVELOPS UNIVERSAL CONNECTOR FOR ALL BOOMS.
For primary bibliographic entry see Field 5G.
W75-10468

AVALANCHE PROTECTION IN SWITZERLAND.
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
Translated from Buendnerwald, Supplement No 9, Journal of the Braubuenden Foresters Association and of SELVA, Assoc. of Graubuenden Wood Producers, Dec 1972. General Technical Report RM-9, March, 1975, 168 p.

Descriptors: *Avalanches, *Reviews, Europe, Structural members, Structural stability, *Structures, Snow management.
Identifiers: *Avalanche control, Avalanche zoning, *Avalanche damage, *Switzerland.

This translation of a collection of 16 articles by Swiss avalanche experts summarizes the current state-of-the-art of structural control of avalanches in Europe. It includes chapters on avalanche formation and damage, supporting structures, deflecting, and retarding structures, and political aspects of controls. (Forest Service)
W75-10656

SNOW AVALANCHE SITES: THEIR IDENTIFICATION AND EVALUATION,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2C.
W75-10659

NEW ENGINEERING CRITERIA FOR SNOW FENCE SYSTEMS,
Forest Service (USDA), Laramie, Wyo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2C.
W75-10692

NEW SNOW FENCE DESIGN CONTROLS DRIFTS, IMPROVES VISIBILITY, REDUCES ROAD ICE,
Forest Service (USDA), Laramie, Wyo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2C.
W75-10693

ROTARY DESALINATION ENGINE AND SYSTEM,
Frontier Engineering Corp., Houston, Tex.; and Zachry (H. B.) Co., San Antonio, Tex. (assignees)
For primary bibliographic entry see Field 3A.
W75-10733

CURRENT WATER SYSTEMS AUTOMATION RESEARCH AND DEVELOPMENT IN THE BUREAU OF RECLAMATION,
Bureau of Reclamation, Denver, Colo.
C. A. Calhoun.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 353-367, 1974. 2 fig, 6 ref.

Descriptors: *Research and development, *Automatic control, *Hydraulic structures, *Mathematical models, *Hydraulic models, Model studies, Hydraulic similitude, Canals, Channels, Automation, Control structures, Check structures, Floods, Gates, Gate control, Control systems, Mechanical control, Hydraulics.

Research and development of equipment and methods for automating water systems are underway in the Bureau of Reclamation. Mathematical models and laboratory models are valuable tools in this effort. Mathematical models are used to simulate hydraulic and control systems. Laboratory models are used to test hardware by allowing 'hands-on' techniques. Emphasis on open channel applications has resulted in new control equipment. The EL-FLO + Reset Controller is an example of such equipment. This controller uses the proportional plus reset mode of control and appears to have wide application to existing and planned water projects. The program described is focused on a typical canal operation. It is recognized that a canal reach or an entire canal may be only a microsystem of a much larger macrosystem which will include the river basin and ultimately the universe. Cooperation with planners and operators to provide the interface between the microsystems which make up water systems is required. Computer operated controllers appear to have advantages for these interfaces. By placing attention on more than one method of developing controls it is felt that rapid progress can be made in reaching the stated goal of improved service to water users with less waste and at a cheaper cost of operation. (See also W75-10769) (Sims-ISWS)
W75-10787

AUTOMATION OF AN EXISTING IRRIGATION SYSTEM - PART I,
Modesto Irrigation District, Calif.
For primary bibliographic entry see Field 8C.
W75-10788

AUTOMATION OF AN EXISTING IRRIGATION SYSTEM - PART I,
Modesto Irrigation District, Calif.
R. G. Ericsen.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York p 369-383, 1974. 19 fig.

Descriptors: *Irrigation systems, *Water control, *Automatic control, *Rehabilitation, *California, Irrigation canals, Construction, Automation, Regulated flow, Control systems, Canals, Irrigation ditches, Irrigation operation and maintenance, Water distribution(Applied), Irrigation engineering, Gate control, Computers.
Identifiers: *Modesto Irrigation District(Cal).

The Modesto Irrigation District lies in California's fertile San Joaquin Valley between the Sierra Nevada Mountains and the San Joaquin River, 75 miles east of San Francisco. Formed in 1887, water was first delivered in 1904. The Tuolumne River passes through San Francisco's Hetch Hetchy reservoirs and power houses before reaching storage in the reservoir behind Don Pedro Dam, owned and operated by the Modesto Irrigation District and her sister, the Turlock Irrigation District. Complicated main canal operations were anticipated in November 1970 with the changeover to the new Don Pedro Dam. The new 2 million acre-feet reservoir inundated the 40 year old, quarter-million acre-feet reservoir. A program of canal gate modifications was undertaken to accomodate the considerable fluctuations of flow in the transmission portion of the main canal to the Modesto Irrigation District's foothill regulating reservoir. These flows were anticipated due to the increased powerhouse discharge capacity used for generation of peaking power. Described and illus-

trated in this report were the several changes made in control gates, automated gate controls, Level sensors, the gate operating machinery. (See also W75-10769) (Sims-ISWS)
W75-10788

FLOAT VALVE PROVIDES VARIABLE FLOW RATES AT LOW PRESSURES,
California Polytechnic State Univ., San Luis Obispo. Dept. of Agricultural Engineering.
J. L. Merriam.
In: Agricultural and Urban Considerations in Irrigation and Drainage; Selected Papers from the Irrigation and Drainage Division Speciality Conference, Fort Collins, Colorado, April 22-24, 1973. American Society of Civil Engineers, New York, p 385-402, 1974. 1 fig, 1 append.

Descriptors: *Irrigation, *Irrigation systems, *Irrigation engineering, *Valves, Flow control, Farm equipment, Hydraulic valves, Regulation, Irrigation practices, Furrow irrigation, Furrow systems, Irrigation design, Operating costs, Equipment, Hydraulics, Engineering, Agricultural engineering, Agriculture.

Semi-closed and closed pipeline systems can provide water delivery that is flexible in rate and duration with 'finger-tip' control at the ultimate point of application. Such delivery is essential for efficient and economical use of water and labor. The water source must be capable of supplying water at variable rates and duration; therefore, an on-farm reservoir is frequently necessary. The extra capital investment to construct such a system is economically justified by reduced annual costs of labor and increased irrigation efficiency. Large capacity systems further increase labor efficiency. Semi-closed systems utilizing a float valve actuated by downstream water levels permit deliveries at low, relatively uniform pressure. Closed systems may develop high pressure on steep or long slopes and have appreciable variation in pressure with changes in flow rates. (See also W75-10769)
W75-10789

GEOTHERMAL POWER PLANT WITH HIGH EFFICIENCY,
P. Baciu.
U. S. Patent No 3,875,749, 10 p, 13 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 933, No 2, p 576, April 8, 1975.

Descriptors: *Patents, *Geothermal studies, *Temperature, Heat exchangers, Powerplants, Electric powerplants, Pressure, Carbon dioxide.
Identifiers: Geothermal powerplant.

Provided is a closed-system geothermal power plant operative and maintained at super-critical pressure in the utilization of carbon dioxide as the power fluid used in the cycle for the driving of a super-critical pressure-type gas turbine and associated generator to electricity. The exhaust effluent is still in a gaseous state but as reduced pressure nevertheless still at super-critical pressure and temperature and is passed through heat exchangers and then passed to a super-critical type condenser in which the gaseous carbon dioxide effluent is condensed to a liquid state. The super-critical pressurized carbon dioxide fluid is fed to a heat exchanger in relationship with, but isolated from, carbon dioxide gas effluent from the gas turbine. Thereafter the superheated carbon dioxide super-critical pressurized superheated gas is fed downwardly through layers of rock to subterranean lithosphere and preferably to within basalt volcanic rock plug covern space either naturally or artificially-excavation occurring. The basalt rock covern space is subdivided into upper chamber(s) and lower space-apart chamber(s) segregated from one another by two intermediate preheater chambers which are in communication with upper chamber and the wells extending from the lower portion of preheated chambers to a lower portion of preheated chambers. (Sinha-OEIS)
W75-10845

8D. Soil Mechanics

NEW CONCEPTS IN SUBURBAN DRAINAGE IN FLORIDA,
Diaz, Seckinger and Associates, Inc., Tampa, Fla.
For primary bibliographic entry see Field 4A.
W75-10793

8E. Rock Mechanics and Geology

PROJECT LOST CREEK: FIELD TESTS OF MOUNDING AND CONTROLLED BLASTING,
Army Engineer Waterways Experiment Station, Livermore, Calif. Explosive Excavation Research Lab.
For primary bibliographic entry see Field 8H.
W75-10553

8F. Concrete

HARRY S. TRUMAN DAM AND RESERVOIR, OSAGE RIVER, MISSOURI, APENDIX A (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 8A.
W75-10363

SPILLWAY FOR BURNSVILLE DAM, LITTLE KANAWHA RIVER, WEST VIRGINIA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W75-10665

8G. Materials

CORROSION AND ITS COST IN SEWAGE TREATMENT,
V. H. Lewin.
Water Pollution Control, Vol 73, No 5, p 548-550, 1974.

Descriptors: *Sewage treatment, *Design criteria, *Construction materials, *Corrosion, Corrosion control, Coating, Paints, Maintenance, *Waste water treatment.
Identifiers: Metal corrosion.

A study was conducted by the Institute of Water Pollution Control (Great Britain) of metal corrosion control in the sewage treatment industry. Goals were to identify major problem areas, to find how local authorities had overcome or attempted to overcome corrosion problems, and to determine the cost of corrosion. Costs were to be broken down into prevention and scheduled maintenance, unscheduled maintenance and repair, and applicable research and development services including consulting. Forty-three sewage works responded to questionnaires. Corrosion is regarded as inevitable and protective measures in the form of paints and coatings vary greatly. Often corrosion is tolerated until it is necessary to replace part or all of the structure; then alternative construction materials may be chosen. Surface treatments should be applied at the time of construction rather than as a later remedial measure for optimal results. However effective the coating, whether it is epoxy resin, paint, chlorinated rubber, or compounds incorporating finely-ground stainless steel, its protection is largely dependent on the thoroughness of surface preparation to clean the bare metal. Costs varied by size, age, and design of the individual sewage treatment plants and no cost generalities could be made from the range of the data. (Prague-FIRL)
W75-10364

LARGE SCALE LABORATORY DIRECT SHEAR TESTS ON ICE,
Alberta Univ., Edmonton. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2C.
W75-10502

SNOW CREEP: ITS ENGINEERING PROBLEMS AND SOME TECHNIQUES AND RESULTS OF ITS INVESTIGATION,
British Columbia Univ., Vancouver. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2C.
W75-10503

THE INFLUENCE SURFACE METHOD FOR FLOATING ICE PLATES,
Ballistic Missile Defense Systems Command Field Office, Madison, N.J.
For primary bibliographic entry see Field 2C.
W75-10504

A WEIBULL PREDICTION OF THE TENSILE STRENGTH-VOLUME RELATIONSHIP OF SNOW,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2C.
W75-10651

PIPELINE STRESS ANALYSIS,
Tulsa Univ., Okla.
For primary bibliographic entry see Field 8B.
W75-10824

8H. Rapid Excavation

PROJECT LOST CREEK: FIELD TESTS OF MOUNDING AND CONTROLLED BLASTING,
Army Engineer Waterways Experiment Station, Livermore, Calif. Explosive Excavation Research Lab.
C. C. McAneny.
Technical Report E-75-1, January 1975. 122 p, 59 fig, 7 tab, 18 ref, 8 append.

Descriptors: *Excavation, *Rock excavation, *Dam construction, *Spillways, Explosives, Explosions, Hydraulic structures, Engineering, Civil engineering, Dams, Diversion structures, Rock mechanics, Construction, On-site investigations.
Identifiers: *Blasting, Mounding.

A concept of blasting termed 'mounding' involves using relatively compact explosive charges and breaking to the horizontal ground surface. Project Lost Creek comprised a group of single-charge and row-charge blasting experiments designed to investigate the concept of mounding. Mounding-row design criteria, fragmentation produced by mounding charges, and performance of mounding explosives with differing properties were studied, as were suitability of mounding for producing rock fill and use of controlled blasting in conjunction with mounding charges to diminish shock and to improve excavation slope control. The Lost Creek experiments were performed in a basaltic andesite rock, which showed columnar jointing a network of closely spaced irregular fractures. Mounding blasts in this rock produced good fragmentation, such that the material was quite acceptable for rock fill. The natural fracture pattern exerted the main control on fragment sizes. Of three bulk explosives tested as mounding charges, ANFO proved to be the most effective, based on total volume of rock broken. A two-lift prototype spillway cut was excavated following blasting with

mounding charges. This achievement demonstrated that mounding offers a feasible method of blast design for structural excavations. (Sims-ISWS)
W75-10553

RESULTS OF AIRBLAST OVERPRESSURE MEASUREMENT PROGRAM AT PROJECT R.D. BAILEY,
Army Engineer Waterways Experiment Station, Livermore, Calif. Explosive Excavations Research Lab.
M. J. Hoeft.
Miscellaneous Paper E-75-4, February 1975. 47 p, 20 fig, 8 tab, 7 ref, 3 append.

Descriptors: *Explosions, *Excavation, *Hazards, *Pressure, Explosives, High pressure, Pressure measuring instruments, Measurement, Dams, Spillways, Construction.
Identifiers: *Airblast overpressure.

Methods of predicting gas-vent and ground-shock-induced airblast overpressure levels from underground explosions have been under investigations for many years. In order to obtain an accurate method for predicting peak overpressures and impulses from large-array-type detonations with different delay periods, more data from this type of event must become available. The airblast overpressure measurement program at R.D. BAILEY resulted in a large amount of data to be used, first, in estimating the airblast expected from future detonations in the R.D. BAILEY spillway area and, second, to provide further input to prediction method studies. A discussion of the instrumentation and procedures used to obtain these data followed a presentation of the results and an analysis of these results. Since peak overpressures from various detonations were caused by several different airblast-producing mechanisms, no definite conclusions could be drawn concerning prediction methods. (Sims-ISWS)
W75-10555

8I. Fisheries Engineering

ESSENTIALITY OF VITAMIN C IN FEEDS FOR INTENSIVELY FED CAGED CHANNEL CATFISH,
Auburn Univ., Ala. Dept. of Fisheries and Allied Aquacultures.
R. T. Lovell.
J Nutr, Vol 103, No 1, p 134-138, 1973. Illus.

Descriptors: *Channel catfish.
Identifiers: Aeromonas-liquefaciens, *Caged catfish, Feeds, Lordosis, Mortality, Pathology, Scoliosis, *Vitamin C, Weight.

Channel catfish fingerlings (1600) were stocked in 1-m3 floating cages, 400/cage, and fed production-type diets intensively for 180 days. Half the fish were fed a diet that was nutritionally sufficient except for being low in vitamin C, and the reamining fish were fed the same formulation with supplemental vitamin C. At the end of the feeding period, each fish was examined for gross signs of vitamin C deficiency, and fish were sampled for examination for internal symptoms by X-ray, tissues analysis, and histological techniques. Weight gains (g), feed conversions (g gain/g feed), survival (%) and incidence of physical deformation (%) for fish fed diets with and without supplemental ascorbic acid, respectively, were 531 vs. 331; 1.29 vs. 1.88; 98.0 vs. 77.8; and 3.9 vs. 45.0. Deformities were primarily scoliosis and lordosis with depigmented areas on backs. Vitamin C deficiency resulted in higher mortality from pathogenic bacteria (Aeromonas liquefaciens) infestation. Differences in response to the 2 diets did not become apparent until after the fish had grown satisfactorily for at least 12 wk or weighed 100-180 g. Dietary supplementation of vitamin C was reflected in blood, liver and anterior kidney contents of ascorbic acid but not in condition of gill filaments or opercula.--Copyright 1973, Biological Abstracts, Inc.
W75-10362

GROWTH FACTORS IN THE FISH MEAL COMPONENTS OF CATFISH DIETS,
Georgia Univ., Savannah. Agricultural Experiment Station.
For primary bibliographic entry see Field 2I.
W75-10658

10. SCIENTIFIC AND TECHNICAL INFORMATION

10A. Acquisition And Processing

INDEX TO WATER RESOURCES DATA FOR LOUISIANA: SURFACE WATER RECORDS; WATER-QUALITY RECORDS.
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 5A.
W75-10590

10C. Secondary Publication And Distribution

ACTIVATED SLUDGE,
California Univ., Davis.
For primary bibliographic entry see Field 5D.
W75-10371

WASTE WATER TREATMENT: WATER RECLAMATION AND REUSE,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 5D.
W75-10372

WASTE WATER TREATMENT: LAND DISPOSAL OF WASTE WATER,
New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 5E.
W75-10373

WASTE WATER TREATMENT: LAGOONS AND OXIDATION PONDS,
Kansas Univ., Lawrence.
For primary bibliographic entry see Field 5D.
W75-10374

WASTE WATER TREATMENT: SLUDGE TREATMENT, UTILIZATION, AND DISPOSAL,
Delaware Univ., Newark. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W75-10395

INDUSTRIAL WASTES: PAPER AND ALLIED PRODUCTS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5D.
W75-10397

TOXICITY OF PULPING WASTES TO FISH,
Institute of Paper Chemistry, Appleton, Wis.
For primary bibliographic entry see Field 5C.
W75-10403

THE LOWER COLORADO RIVER: A BIBLIOGRAPHY,
Arizona Western Coll., Yuma.
R. Yates, and M. Marshall.
Arizona Western College Press, Yuma, 1974. 153 p.

Descriptors: *Bibliographies, *Colorado River, *Mexican Water Treaty, *History, *Political aspects, Saline water, Indian reservations.

Over fourteen hundred entries dealing primarily or in part with the lower Colorado River are identified. While there is some emphasis on historical records, including early exploration and settlement, the military, and stream navigation, the main attention is on the Colorado Delta, Mexico and the Colorado River, the politics of water, reclamation, mining, and urbanization. The physiography of the Colorado is of increasing importance, and these bibliographical references to its dams, reclamation and irrigation projects, and salinity problems are a useful backup for technical and lay persons. Author and subject indexes are provided. (Paylore-Arizona)
W75-10453

10F. Preparation Of Reviews

ACTIVATED SLUDGE,
California Univ., Davis.
For primary bibliographic entry see Field 5D.
W75-10371

WASTE WATER TREATMENT: WATER RECLAMATION AND REUSE,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 5D.
W75-10372

WASTE WATER TREATMENT: LAND DISPOSAL OF WASTE WATER,
New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 05E.
W75-10373

WASTE WATER TREATMENT: LAGOONS AND OXIDATION PONDS,
Kansas Univ., Lawrence.
For primary bibliographic entry see Field 05D.
W75-10374

WASTE WATER TREATMENT: SLUDGE TREATMENT, UTILIZATION, AND DISPOSAL,
Delaware Univ., Newark. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05D.
W75-10395

INDUSTRIAL WASTES: PAPER AND ALLIED PRODUCTS,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 05D.
W75-10397

PROCESS DESIGN MANUAL FOR SLUDGE TREATMENT AND DISPOSAL.
Environmental Protection Agency, Washington, D.C. Technology Transfer Staff.
For primary bibliographic entry see Field 05D.
W75-10475

SUBJECT INDEX

AALABAMA RIVER
Flood Plain Information: Catoma Creek, Vicinity of Montgomery, Alabama.
W75-10574 4A

ABSORPTION
Studies on the Metabolism of Chlorophenols in Fish-I Absorption and Excretion of PCP by Goldfish,
W75-10417 5C

Effect of Water Hardness on the Toxicity of a Nonionic Detergent to Fish,
W75-10444 5C

The Effect of Temperature and Salinity on Cadmium Uptake by the Blue Crab, Callinectes sapidus,
W75-10448 5C

Absorption of Cadmium, Copper and Zinc by Dog Whelks in the Bristol Channel,
W75-10481 5B

Arsenate Uptake and Reduction by Pocillopora verrucosa,
W75-10491 5C

Residue Analyses on 2-Amino-4 Phenylthiazole, a Piscine Anesthetic, in Fishes-I a Model Radio-Tracer Experiment with Medaka,
W75-10614 5A

Absorption, Metabolism, and Excretion by Goldfish of the Anionic Detergent Sodium Lauryl Sulphate,
W75-10626 5C

ACCIDENTS
The Snowy Torrents: Avalanche Accidents in the United States 1967-71,
W75-10657 2C

ACID MINE WATER
Some Observations on Spawning of Brook Trout (Salvelinus Fontinalis Mitchill) in Lime Neutralized Iron Hydroxide Suspensions,
W75-10445 5C

ACROLEIN.
Predicting the Concentration of Aquatic Herbicide Residues in Waterways,
W75-10648 5B

ACTINOMYCETES
Production of Microbial Protein From Waste Cellulose by Thermomonospora Fusca, A Thermophilic Actinomycete,
W75-10538 5C

ACTIVATED CARBON
Treatment of Service Water with Ozone,
W75-10840 5D

ACTIVATED SLUDGE
Activated Sludge,
W75-10371 5D

Effect of Temperature and Sludge Loading on 5-Day BOD Removal and Sludge Settleability in Activated Sludge Systems Treating Bleached Kraft Effluents,
W75-10379 5D

Studies on Possibilities of Biochemical Purification of Evaporator Condensate Occurring During Sulfite Pulp Manufacture (Untersuchungen ueber die Moeglichkeit der biochemischen Reinigung des bei der Sulfitzellstoffherstellung anfallenden Eindampfkondensates),
W75-10382 5D

Treatment of Winery Wastes by Aerated Lagoon, Activated Sludge, and Rotating Biological Contractor,
W75-10685 5D

Multiple Cycle Process for Wastewater Purification,
W75-10738 5D

ADDITIVE INDEX
Toxicity of Paired Mixtures of Candidate Forest Insecticides to Rainbow Trout,
W75-10439 5C

ADRIATIC SEA
The Concentration of Mercury, Copper, Nickel, Silver, Cadmium and Lead in the Northern Adriatic Anchovy, Engraulis Encrasicholus, and Sardine, Sardina Pilchardus,
W75-10620 5B

ADSORPTION
Adsorption and Degradation of Chlorbromuron in Soil,
W75-10414 5B

Studies on the Metabolism of Chlorophenols in Fish-II Turnover in Absorbed PCP in Goldfish,
W75-10418 5C

Characterization of Cadmium Uptake by Plant Tissue,
W75-10479 5B

AERATED LAGOONS
Waste Water Treatment: Lagoons and Oxidation Ponds,
W75-10374 5D

Organic Compounds in Pulp Mill Lagoon Discharge,
W75-10402 5D

Treatment of Winery Wastes by Aerated Lagoon, Activated Sludge, and Rotating Biological Contractor,
W75-10685 5D

AERATION
Plant Performance Using Dissolved Oxygen Control,
W75-10452 5D

AEROBIC TREATMENT
Treatment of Milk Truck Washing Wastes by Anerobic Digestion,
W75-10673 5D

AFRICA
Tar Pollution of Sierra Leone Beaches,
W75-10472 5B

AGRICULTURAL CHEMICALS
Evaluation of Agricultural Drainage in Water Quality Management,
W75-10796 5G

AGRICULTURAL ENGINEERING
Hydrology of the Albemarle-Pamlico Region, North Carolina--A Preliminary Report on the Impact of Agricultural Developments,
W75-10602 4C

AGRICULTURAL RUNOFF
Evaluation of Agricultural Drainage in Water Quality Management,
W75-10796 5G

Effects of Farming - Urban Drainage on Fresh Water,
W75-10802 5G

Five Year Study of Des Moines River Water Quality,
W75-10803 5B

AGRICULTURAL WATERSHEDS
ACTMO, An Agricultural Chemical Transport Model,
W75-10846 5B

AIR POLLUTION
Average Trace Element Composition of Low Level Marine Atmospheric Particulates,
W75-10477 5B

Toxic Trace Elements: Preferential Concentration in Respirable Particles,
W75-10482 5A

Water Pollution Problems Associated with Control of Stack Gas Emission,
W75-10691 5B

Air and Water Pollution Control,
W75-10732 5D

AIR POLLUTION EFFECTS
Health Implications of Exposure to Trace Metals from Combustion of Waste Oil,
W75-10765 5C

AIR PURIFICATION
Importance of Plants in Oxygen Production, Carbon Dioxide Consumption and Air Purification,
W75-10715 2I

AIR TEMPERATURE
Analog Temperature Records from a Linearized Thermistor Network,
W75-10650 7B

Canopy Weight Distribution Affects Windspeed and Temperature in a Lodgepole Pine Forest,
W75-10654 4A

AIRBLAST OVERPRESSURE
Results of Airblast Overpressure Measurement Program at Project R.D. Bailey,
W75-10555 8H

AIRPORTS
Lake Erie International Jetport Model Feasibility Investigation, Physical Model Feasibility Study,
W75-10670 8B

Environmental Action at Port Authority Airports,
W75-10748 5G

ALABAMA
Theoretical and Applied Concepts of Water Resources for Social Welfare.
W75-10354 6B

Flood Plain Information: Catoma Creek, Vicinity of Montgomery, Alabama.
W75-10574 4A

ALASKA
Icings Along the Trans-Alaska Pipeline Route,
W75-10592 2C

Channel Erosion Surveys Along Southern Segment of the Taps Route, Alaska, 1972 and 1973,
W75-10594 8B

800 Miles to Go,
W75-10638 5C

ALASKA PIPELINE
800 Miles to Go,
W75-10638 5C

ALGAE
Effect of the Insecticide Zectran (Mexacarbate) on Several Algae,
W75-10425 5C

The Effects of a No. 2 Fuel Oil and Two Crude Oils on the Growth and Photosynthesis of Microalgae,
W75-10436 5C

The Effect of Heavy Metals on Photosynthesis and Loss of Cell Potassium in Two Species of Marine Algae, Dunaliella tertiolecta and Phaeodactylum tricornutum,
W75-10447 5C

Thallium: Occurrence in the Environment and Toxicity to Fish,
W75-10449 5C

Enrichment of Surface Freshwater Microlayers with Algae,
W75-10583 5A

Problems Related to Water Quality and Algal Control in Lopez Reservoir, San Luis Obispo County, California,
W75-10601 5B

The Effect of Some Heavy Metal Ions on Photosynthesis in a Freshwater Alga,
W75-10627 5C

Effects of Chlorinated Hydrocarbon Pollutants on Growth of Marine Phytoplankton in Culture,
W75-10636 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-nitrophenol (TFM) to 10 Species of Algae,
W75-10697 5C

ALGAL CONTROL
Problems Related to Water Quality and Algal Control in Lopez Reservoir, San Luis Obispo County, California,
W75-10601 5B

ALGEBRA OF SIGNS
Qualitative Sign Matrix Manipulation,
W75-10815 6A

ALPINE
Water-Yield Improvement from Alpine Areas: The Status of Our Knowledge,
W75-10660 3B

ALTERNATIVE PLANNING
Nuclear Power Plant Cooling System Selection,
W75-10822 6C

AMMONIA
Urea in the Waters of Lake Kinneret (Sea of Galilee),
W75-10420 5C

Acute Toxicity of Ammonia to Several Developmental, Stages of Rainbow Trout, Salmo Gairdneri,
W75-10619 5C

ANAEROBIC DIGESTION
The Toxicity of Heavy Metal Ions to Anaerobic Digestion,
W75-10843 5D

ANALYTICAL TECHNIQUES
Determination of the Transition Metals Manganese, Iron, Cobalt, Copper and Zinc in River Fishes With Help of X-Ray Fluorescence Analysis and Flameless Atomic Absorption Spectroscopy, (Bestimmung der Ubergangsmetalle Mangan, Eisen, Kobalt, Kupfer und zink in Flussfischen mit Hilfe der Rontgenfluores-zenzanalyse und der flammenlosen Atomabsorption),
W75-10408 5A

X-ray Microanalysis of Zinc and Iron in the Cheloride Cells of Mayfly Larvae of the River Sulz, (Rontgenmikroanalyse von Zink und Eisen in Chloridzellen von Eintagsfligenlarven aus der Sulz),
W75-10416 5A

The Determination of Mercury in Soils and Related Materials by Cold-Vapour Atomic Absorption Spectrometry,
W75-10485 5A

Atomic-Absorption Spectrometric Determination of Copper, Lead, Cadmium and Manganese in Pulp and Paper by the Direct-Atomization Technique,
W75-10489 5A

Determination of Nickel in Rocks After Epithermal Neutron Activation,
W75-10493 2K

Uranium, Thorium, and Lead Concentrations in Three Silicate Standards and a Method of Lead Isotopic Analysis,
W75-10494 2K

Spectroscopic Determination of Atomization Efficiency (CuCl-Cu+Cl) in an Air-Hydrogen Flame,
W75-10498 2K

Rapid Extractive Spectrophotometric Determination of Gold (III) With 4-(2-Pyridylazo)-Resorcinol,
W75-10499 2K

Laboratory Measurement of Surface Temperature Fluctuations Induced by Small Amplitude Surface Waves,
W75-10505 2L

Automated Sequential Composite Sampling. A New Technique for Water Pollution Study and Control,
W75-10690 5A

Water Analysis of River Waters in Kagawa (IX), Chemical Composition of the Aya Water Basin, (In Japanese),
W75-10841 2K

ANCHOVY
The Concentration of Mercury, Copper, Nickel, Silver, Cadmium and Lead in the Northern Adriatic Anchovy, Engraulis Encrasicholus, and Sardine, Sardina Pilchardus,
W75-10620 5B

ANEROBIC DIGESTION
Treatment of Milk Truck Washing Wastes by Anerobic Digestion,
W75-10673 5D

ANESTHETIC (PISCINE)
Residue Analyses on 2-Amino-4 Phenylthiazole, a Piscine Anesthetic, in Fishes-I a Model Radio-Tracer Experiment with Medaka,
W75-10614 5A

ANIMAL BEHAVIOR
Effects of Methylmercury on Approach and Avoidance Behavior of Mallard Ducklings,
W75-10424 5C

ANIMAL METABOLISM
Effect of Dietary Selenium on Glutathione Peroxidase in the Chick,
W75-10495 5A

ANIMAL PATHOLOGY
Effect of Dietary Selenium on Glutathione Peroxidase in the Chick,
W75-10495 5A

ANION EXCHANGE
Determination of Cadmium, Copper, and Lead in Natural Waters After Anion-Exchange Separation,
W75-10385 5A

ANODIC STRIPPING VOLTAMMETRY
The Effect of Certain Organic Pollutants on Copper Toxicity to Fish (Lebistes Reticulatus),
W75-10637 5C

ANTARCTIC
Soils of the High Arctic Landscapes,
W75-10458 2C

ANTELOPE VALLEY AREA (CALIF)
Map of the Antelope Valley-East Kern Water Agency Area, California, Showing Ground-Water Subunits and Areas, Location of Wells, and Water-Level Contours for Spring 1974,
W75-10595 7C

ANTIBIOTICS
Acute Toxicity of Kanamycin to Steelhead Trout (Salmo Gairdneri),
W75-10423 5C

ANTIBIOTICS (PESTICIDES)
Effects of pH on Toxicity of Antimycin to Fish,
W75-10450 5C

ANTIMYCIN
Effects of pH on Toxicity of Antimycin to Fish,
W75-10450 5C

APPLICATION METHODS
Land Treatment of Municipal Sewage,
W75-10719 5D

AQUATIC ALGAE
An Investigation of the Ecology and Water Quality of a Lake Outlet,
W75-10724 5C

AQUATIC ANIMALS
Population Dynamics of Protozoa in Wastewater, and Impact of Environmental Changes,
W75-10689 5D

AQUATIC HERBICIDE PROPERTIES
Herbicides in Aquatic Systems,
W75-10625 5C

AQUATIC INSECTS
Uptake, Elimination and Biotransformation of the Lampricide 3-Trifluromethyl-4-Nitrophenol (TFM) by Larvae of the Aquatic Midge Chironomus Tentans,
W75-10629 5C

An Investigation of the Ecology and Water Quality of a Lake Outlet,
W75-10724 5C

AQUATIC PLANTS
Herbicides in Aquatic Systems,
W75-10625 5C

AQUATIC WEED CONTROL
Predicting the Concentration of Aquatic Herbicide Residues in Waterways,
W75-10648 5B

AQUEDUCTS
Some Factors Affecting Control of Flow in a Large Canal System,
W75-10786 8B

AQUEOUS SOLUTIONS
Automatic Device for the Operational Control of the Filtration Rate of Suspensions(Automatische Vorrichtung zur Technischen Kontrolle der Filtrationsgeschwindigkeit von Suspensionen),
W75-10830 5D

AQUICULTURE
The Effect of Prolonged Exposure to Elevated Temperatures on the Biochemical Constituents, Gonadal Development and Shell Deposition of the American Oyster, Crassostrea Virginica,
W75-10849 5C

AQUIFER CHARACTERISTICS
Hydraulic Behaviour of the Chalk Aquifer in the Yorkshire Wolds,
W75-10506 4B

Hydrogeology of the Triassic Rocks of Maryland,
W75-10584 2F

A Predictive Computer Model of the Lower Cretaceous Aquifer, Franklin Area, Southeastern Virginia,
W75-10599 2F

AQUIFER TESTING
Hydraulic Behaviour of the Chalk Aquifer in the Yorkshire Wolds,
W75-10506 4B

ARCTIC
Some Aspects of Climatology in Polar Barrens,
W75-10454 2C

A Climatological Analysis of North Polar Desert Areas,
W75-10455 2C

Soils of the High Arctic Landscapes,
W75-10458 2C

Review of Development of Arctic Resources,
W75-10462 2C

Resource Development in Canada's High Arctic,
W75-10463 2C

Icebreaking Drillship for Offshore Exploratory Drilling in the Arctic,
W75-10639 5G

ARCTIC OCEAN
Toward an Ice-Free Arctic Ocean,
W75-10532 2C

Floating Glacial Ice Caps in the Arctic Ocean,
W75-10533 2C

ARID CLIMATES
Some Aspects of Climatology in Polar Barrens,
W75-10454 2C

ARIZONA
Stochastic Models of Spatial and Temporal Distribution of Thunderstorm Rainfall.
W75-10519 2B

Change in Quality of Pumped Drainage Effluent,
W75-10779 5B

Wellton-Mohawk Drainage and the Mexican Salt Problem,
W75-10783 4A

Utilization of Sewage Effluent for Irrigation,
W75-10798 5D

Methodological Problems in Applying the Straw Man to Real Life Problems,
W75-10814 6A

ARKANSAS
Flood Plain Information: Ouachita River, Hot Springs Creek, Stokes Creek, Molly Creek, Gulpha Creek, City of Hot Springs, Arkansas.
W75-10559 4A

AROCLORS
Uptake of Three Polychlorinated Biphenyls, DDT and DDE by the Green Sunfish, Lepomis Cyanellus Raf.,
W75-10422 5C

ARSENIC COMPOUNDS
Arsenate Uptake and Reduction by Pocillopora verrucosa,
W75-10491 5C

ARTESIAN AQUIFERS
Drainage Analysis of a Confining Formation,
W75-10780 4A

ARTIFICAL SUBSTRATES
Acute Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitro-Phenol (TFM) to Nymphs of Mayflies (Hexagenia Sp.),
W75-10699 5C

ARTIFICIAL PRECIPITATION
Users' View of Weather Modification,
W75-10776 3B

ASSESSMENT
Necessary Adaptations for Significant Utilization of the Information System,
W75-10816 6A

ASULAM
Herbicides in Aquatic Systems,
W75-10625 5C

ATLANTIC OCEAN
Wave Climate Model of the Mid-Atlantic Shelf and Shoreline (Virginian Sea), Model Development, Shelf Geomorphology, and Preliminary Results,
W75-10552 2L

ATLANTIC SALMON
Temperature-Induced Changes in Acute Toxicity of Zinc to Atlantic Salmon (Salmo salar),
W75-10431 5C

ATOMIC ABSORPTION SPECTROMETRY
The Determination of Mercury in Soils and Related Materials by Cold-Vapour Atomic Absorption Spectrometry,
W75-10485 5A

ATOMIC ABSORPTION SPECTROSCOPY
Atomic-Absorption Spectrometric Determination of Copper, Lead, Cadmium and Manganese in Pulp and Paper by the Direct-Atomization Technique,
W75-10489 5A

Atomic Absorption Spectrometric Determination of Cadmium, Lead, Silver, Thallium and Zinc in Silicate Rocks by Direct Atomization From the Solid State,
W75-10492 2K

ATPASES
Inhibition of ATPases Acitivity in Channel Catfish Brain by Kepone(Trade Name) and its Reduction Product,
W75-10612 5C

ATTITUDES
The Effect of Landowner Attitude on the Financial and the Economic Costs of Acquiring Land for a Large Public Works Project,
W75-10827 6B

AUSTRALIA
Valley Design in Urban Growth Centres,
W75-10643 6B

The Mutual Destruction of Polluting Factors in Waste Liquors,
W75-10645 5D

Progress in Australian Hydrology 1965-1974.
W75-10646 2A

Flood Waves and Suspended Sediment Pulses in Urbanized Catchments,
W75-10647 4C

Trace Elements in Melbourne Rivers - An Interlaboratory Analysis,
W75-10649 5A

AUTOMATIC CONTROL
Current Water Systems Automation Research and Development in the Bureau of Reclamation,
W75-10787 8C

Automation of an Existing Irrigation System - Part I,
W75-10788 8C

AUTOMATION
Plant Performance Using Dissolved Oxygen Control,
W75-10452 5D

Automatic Device for the Operational Control of the Filtration Rate of Suspensions(Automatische Vorrichtung zur Technischen Kontrolle der Filtrationsgeschwindigkeit von Suspensionen),
W75-10830 5D

AUTOREGRESSIVE RUNOFF MODELS
Use of Autoregressive Runoff Models in Reservoir Studies,
W75-10523 2E

AVALANCHE
Avalanche Warnings: Content and Dissemination,
W75-10653 2C

AVALANCHE CONTROL
Avalanche Protection in Switzerland.
W75-10656 8C

AVALANCHE DAMAGE
Avalanche Protection in Switzerland.
W75-10656 8C

AVALANCHE SAFETY
The Snowy Torrents: Avalanche Accidents in the United States 1967-71,
W75-10657 2C

AVALANCHE SITES
Snow Avalanche Sites: Their Identification and Evaluation,
W75-10659 2C

AVALANCHES
Avalanche Protection in Switzerland.
W75-10656 8C

The Snowy Torrents: Avalanche Accidents in the United States 1967-71,
W75-10657 2C

Snow Avalanche Sites: Their Identification and Evaluation,
W75-10659 2C

AYA WATER BASIN (JAPAN)
Water Analysis of River Waters in Kagawa (IX), Chemical Composition of the Aya Water Basin, (In Japanese),
W75-10841 2K

BACTERIA
Environmental Limitations on the Microbial Degradation of Hydrocarbons in Temperate Lakes,
W75-10407 5C

Deterioration of Water Quality in Distribution Systems,
W75-10711 5F

The Effect of the Quantity of Silt to the Attached Microorganisms of the Kuzuryu-Gawa River in the Hokuriku District, (In Japanese),
W75010696 5C

BALTIC FLOUNDER
The Effect of Different Salinities and Manganese Ion on the Survival Respiration of the Baltic Flounder (Pleuronectes Flesus Trachurus (Dunker)) of the Gulf of Riga,
W75-10411 5C

BALTIMORE HARBOR (MD)
A Program for Handling Emergency Oil Spillages in the Port of Baltimore,
W75-10755 5G

BARLEY
Effect of a Phytoplankton Culture on the Germination and Seedling Development of Barley, Sugar Beets and Lettuce,
W75-10496 3F

BASIC DATA COLLECTIONS
Ground-Water Levels in New Mexico, 1972,
W75-10582 4B

Hydrogeologic Data for the Farmington River Basin, Connecticut,
W75-10591 7C

Hydrological Data From Wells in Southwest Hillsborough County, Florida, 1950-74,
W75-10593 7C

Temperatures of Wyoming Streams,
W75-10604 7C

Ground-Water Conditions in Utah, Spring of 1975,
W75-10606 2F

BEARSS LEMON
Responses of 'Bearss' Lemon to Nitrogen, Potassium and Irrigation Applications,
W75-10714 3F

BED LOAD
Research in Stochastic Models for Bedload Transport,
W75-10522 2J

Dispersion of Contaminated Bedload Particles,
W75-10526 5B

BED-MATERIAL TRANSPORT
Total Sediment Load by the Extrapolated Data Procedure,
W75-10847 2J

BEDFORD (IA)
Flood Plain Information: East Fork One Hundred and Two River, Bedford, Iowa.
W75-10566 4A

BENEFITS
Derivation of Reservoir Operating Rules by Economic Analysis,
W75-10825 4A

Analysis of Reservoir Recreation Benefits,
W75-10826 6B

BENTHIC FAUNA
Utilization of a Kraft Effluent Channel by Fish and Aquatic Organisms,
W75-10377 5C

BENTHOS
Evaluation of Three Side Channels and the Main Channel Border of the Middle Mississippi River as Fish Habitat,
W75-10451 5C

BERING SEA
Review of Development of Arctic Resources,
W75-10462 2C

BIBLIOGRAPHIES
Activated Sludge,
W75-10371 5D

Waste Water Treatment: Water Reclamation and Reuse,
W75-10372 5D

Waste Water Treatment: Land Disposal of Waste Water,
W75-10373 5E

Waste Water Treatment: Lagoons and Oxidation Ponds,
W75-10374 5D

Waste Water Treatment: Sludge Treatment, Utilization, and Disposal,
W75-10395 5D

Industrial Wastes: Paper and Allied Products,
W75-10397 5D

Toxicity of Pulping Wastes to Fish,
W75-10403 5C

The Lower Colorado River: A Bibliography,
W75-10453 10C

BILGE WATER
Oily Bilge from Commercial Vessels,
W75-10752 5B

BIOACCUMULATION
Determination of the Transition Metals Manganese, Iron, Cobalt, Copper and Zinc in River Fishes With Help of X-Ray Fluorescence Analysis and Flameless Atomic Absorption Spectroscopy, (Bestimmung der Ubergangsmetalle Mangan, Eisen, Kobalt, Kupfer und zink in Flussfischen mit Hilfe der Rontgenfluores-zenzanalyse und der flammenlosen Atomabsorption),
W75-10408 5A

Effect of a Mixture of Succinic Acid Mono-Sulpho-Ester and Olefin Sulfonate on Fish (Uber die Wirkung einer Mischung von Sulfobernsteinsaure-halbester und Olefinsulfonat auf Fische),
W75-10409 5C

Corticosteroid Concentrations in Sockeye Salmon (Oncorhynchus Nerka) Exposed to Low Concentrations of Copper,
W75-10415 5C

BIOASSAY
The Effect of Different Salinities and Manganese Ion on the Survival Respiration of the Baltic Flounder (Pleuronectes Flesus Trachurus (Dunker)) of the Gulf of Riga,
W75-10411 5C

Toxic Effects of Aliphatic Chlorinated by-Products from Vinyl Chloride Production on Marine Animals,
W75-10412 5C

Studies on the Metabolism of Chlorophenols in Fish-I Absorption and Excretion of PCP by Goldfish,
W75-10417 5C

Studies on the Metabolism of Chlorophenols in Fish-II Turnover in Absorbed PCP in Goldfish,
W75-10418 5C

Marine Pollution Bioassay by Sea Urchin Eggs, An Attempt to Enhance Accuracy,
W75-10419 5A

Uptake of Three Polychlorinated Biphenyls, DDT and DDE by the Green Sunfish, Lepomis Cyanellus Raf.,
W75-10422 5C

Effects of Heavy Metals and Pesticides on the Mass Mortalities of Cultured Shellfishes Along the Southwest Coast of Taiwan, (In Chinese),
W75-10427 5C

DDT : Short Term Effects on Osmoregulation in Black Surfperch (Embiotoca Jacksoni),
W75-10429 5C

Bioassay Data for Marine Pollution Using Sea Urchin Eggs, 1972 and 1973,
W75-10432 5A

Effects of the Insecticide Sevin and Its First Hydrolytic Product, 1-Napthol, on Some Early Developmental Stages of the Bay Mussel, Mytilus edulis,
W75-10435 5C

The Effects of a No. 2 Fuel Oil and Two Crude Oils on the Growth and Photosynthesis of Microalgae,
W75-10436 5C

Toxicity of Two Synthetic Pyrethrins to Brown Trout,
W75-10438 5C

Toxicity of Paired Mixtures of Candidate Forest Insecticides to Rainbow Trout,
W75-10439 5C

Multichannel Toxicant Injection System for Flow-Through Bioassays,
W75-10443 5A

Effect of Water Hardness on the Toxicity of a Nonionic Detergent to Fish,
W75-10444 5C

Thallium: Occurrence in the Environment and Toxicity to Fish,
W75-10449 5C

Inhibition of ATPases Acitivity in Channel Catfish Brain by Kepone(Trade Name) and its Reduction Product,
W75-10612 5C

On the Accumulation of Organochlorine Pesticides, PCB and Certain Heavy Metals in Fish and Shellfish from Thai Coastal and Inland Waters,
W75-10616 5B

The Concentration of Mercury, Copper, Nickel, Silver, Cadmium and Lead in the Northern Adriatic Anchovy, Engraulis Encrasicholus, and Sardine, Sardina Pilchardus,
W75-10620 5B

PCBS in the Spotted Sharks, Mustelus Manazo, From Tokyo Bay, (In Japanese),
W75-10622 5A

The Effect of Sublethal Concentrations of Copper and Zinc on Ventilatory Activity, Blood Oxygen, and pH in Rainbow Trout (Salmo Gairdneri),
W75-10624 5C

Absorption, Metabolism, and Excretion by Goldfish of the Anionic Detergent Sodium Lauryl Sulphate,
W75-10626 5C

Uptake, Elimination and Biotransformation of the Lampricide 3-Trifluromethyl-4-Nitrophenol (TFM) by Larvae of the Aquatic Midge Chironomus Tentans,
W75-10629 5C

Physiological Changes in the Serum and Hepatopancreas of Yellow Tail Injected with Carbon Tetrachloride, (In Japanese),
W75-10630 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) to the Nontarget Fish in Static Tests,
W75-10701 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) to Selected Aquatic Invertebrates and Frog Larvae,
W75-10703 5C

Combined Effects of Cadmium and Salinity on Development and Survival of Herring Eggs,
W75-10704 5C

A Gravity-Flow Column to Provide Pesticide-Laden Water for Aquatic Bioassays,
W75-10844 5A

The Effect of the Quantity of Silt to the Attached Microorganisms of the Kuzuryu-Gawa River in the Hokuriku District, (In Japanese),
W75010696 5C

BIOASSAYS

Effects of Mirex on the Larval Development of Blue Crab,
W75-10410 5C

Acute Toxicity of Ammonia to Several Developmental, Stages of Rainbow Trout, Salmo Gairdneri,
W75-10619 5C

BIOCHEMICAL OXYGEN DEMAND

Effect of Temperature and Sludge Loading on 5-Day BOD Removal and Sludge Settleability in Activated Sludge Systems Treating Bleached Kraft Effluents,
W75-10379 5D

Analytic Characterization of Sewer Loading by Spent Liquors of the Pulp Industry (Analytische Kennzeichung der Belastung der Vorfluter durch Ablaugen der Zellstoffindustrie),
W75-10381 5D

BIOCHEMISTRY

Persistence of Cadmium-Induced Metabolic Changes in Liver and Kidney,
W75-10478 5A

Studies on the Metabolism of Chlorophenols in Fish-III Isolation and Identification of a Conjugated PCP Excreted by Goldfish,
W75-10611 5A

BIODEGRADATION

Cellulose Degradation in Waste Water Treatment,
W75-10376 5D

Environmental Limitations on the Microbial Degradation of Hydrocarbons in Temperate Lakes,
W75-10407 5C

An Evaluation of Persistency for Water Borne Organics,
W75-10850 5B

BIOINDICATORS

Marine Pollution Bioassay by Sea Urchin Eggs, An Attempt to Enhance Accuracy,
W75-10419 5A

Bioassay Data for Marine Pollution Using Sea Urchin Eggs, 1972 and 1973,
W75-10432 5A

The Effect of the Quantity of Silt to the Attached Microorganisms of the Kuzuryu-Gawa River in the Hokuriku District, (In Japanese),
W75010696 5C

BIOLOGICAL COMMUNITIES

Evaluation of Three Side Channels and the Main Channel Border of the Middle Mississippi River as Fish Habitat,
W75-10451 5C

BIOLOGICAL HALF LIFE

The Biological Half-Life of Inorganic Mercury in the Dungeness Crab (Cancer magister),
W75-10437 5C

BIOLOGICAL TREATMENT

Studies on Possibilities of Biochemical Purification of Evaporator Condensate Occurring During Sulfite Pulp Manufacture (Untersuchungen ueber die Moeglichkeit der biochemischen Reinigung des bei der Sulfitzellstoffherstellung anfallenden Eindampfkondensates),
W75-10382 5D

Rotating Biological Disk Treatment of Kraft Mill Effluents,
W75-10390 5D

The Mutual Destruction of Polluting Factors in Waste Liquors,
W75-10645 5D

An Effluent Study of a Fresh Water Fish Processing Plant,
W75-10684 5D

Treatment of Winery Wastes by Aerated Lagoon, Activated Sludge, and Rotating Biological Contractor,
W75-10685 5D

Multiple Cycle Process for Wastewater Purification,
W75-10738 5D

BIOMASS

Canopy Weight Distribution Affects Windspeed and Temperature in a Lodgepole Pine Forest,
W75-10654 4A

An Investigation of the Ecology and Water Quality of a Lake Outlet,
W75-10724 5C

BIORHYTHMS

Aspects of the Winter Ecology of Juvenile Coho Salmon (Oncorhynchus Kisutch) and Steelhead Trout (Salmo Gairdneri),
W75-10615 5C

BIRDS

Residues of Polychlorinated Biphenyls (PCB) and Chlorinated Pesticides in Fish and Birds of the Po Delta, (Residus de Polychlorobiphenyls (PCB) et de Pesticides Chlores Dans Les Poissons et Les Oiseaux du Delta du Po),
W75-10446 5B

BLACK SURFPERCH

DDT : Short Term Effects on Osmoregulation in Black Surfperch (Embiotoca Jacksoni),
W75-10429 5C

BLASTING

Project Lost Creek: Field Tests of Mounding and Controlled Blasting,
W75-10553 8H

BLEACHING WASTES

Effect of Temperature and Sludge Loading on 5-Day BOD Removal and Sludge Settleability in Activated Sludge Systems Treating Bleached Kraft Effluents,
W75-10379 5D

Swimming Performance of Juvenile Coho Salmon (Oncorhynchus Kisutch) Exposed to Bleached Kraft Pulp Mill Effluent,
W75-10387 5C

How to Purify Effluents, Recover Byproducts With Reverse Osmosis,
W75-10391 5F

Spent Liquor From Peroxide Bleaching of Groundwood Pulp From Spruce,
W75-10392 5A

Color of Pulp Industry Waste Liquors. (6). Behavior of Color During Waste Treatments (In Japanese),
W75-10393 5D

BLIZZARDS

New Engineering Criteria for Snow Fence Systems,
W75-10692 2C

New Snow Fence Design Controls Drifts, Improves Visibility, Reduces Road Ice,
W75-10693 2C

Estimating the Transport and Evaporation of Blowing Snow,
W75-10695 2C

BLOWING SNOW

Estimating the Transport and Evaporation of Blowing Snow,
W75-10695 2C

BLUE CRAB

Effects of Mirex on the Larval Development of Blue Crab,
W75-10410 5C

BLUE CRABS
The Effect of Temperature and Salinity on Cadmium Uptake by the Blue Crab, Callinectes sapidus,
W75-10448 5C

BOATING
Analysis of Pollution from Marine Engines - Status Report,
W75-10688 5A

BOND ISSUES
Financing Water Works,
W75-10712 3D

BOUNDARY PROCESSES
A Theory of the Mass Transport of Previously Distributed Chemicals in a Water-Saturated Sorbing Porous Medium: 4. Distributions,
W75-10632 5B

BRANDYWINE CREEK (PA)
Flood Plain Information: Brandywine Creek, Chester County, Pennsylvania.
W75-10562 4A

BRAZOS RIVER (TEX)
The Drift of Mayflies (Ephemeroptera) in the Brazos River, Texas,
W75-10558 5B

BROOK TROUT
Some Observations on Spawning of Brook Trout (Salvelinus Fontinalis Mitchill) in Lime Neutralized Iron Hydroxide Suspensions,
W75-10445 5C

Toxaphene Effects on Growth and Development of Brook Trout (Salvelinus Fontinalis),
W75-10621 5C

BROWN BULLHEAD
Influence of a Thermal Effluent on Movement of Brown Bullhead (Ictalurus Nebulosus) as Determined by Ultrasonic Tracking,
W75-10628 5C

BROWN TROUT
Toxicity of Two Synthetic Pyrethrins to Brown Trout,
W75-10438 5C

BUCKEYE (ARIZ)
Utilization of Sewage Effluent for Irrigation,
W75-10798 5D

BULLHEADS
Influence of a Thermal Effluent on Movement of Brown Bullhead (Ictalurus Nebulosus) as Determined by Ultrasonic Tracking,
W75-10628 5C

BURNSVILLE LAKE (WV)
Spillway for Burnsville Dam, Little Kanawha River, West Virginia; Hydraulic Model Investigation,
W75-10665 8B

BUSHKILL CREEK (PA)
Flood Plain Information: Bushkill Creek, Vicinity of Easton, Pennsylvania.
W75-10560 4A

BYPRODUCTS
How to Purify Effluents, Recover Byproducts With Reverse Osmosis,
W75-10391 5F

CADMIUM
Determination of Cadmium, Copper, and Lead in Natural Waters After Anion-Exchange Separation,
W75-10385 5A

Heavy Metal Contents of Fishes Caught in Kaohsiung Harbor, (In Chinese),
W75-10430 5A

The Effect of Temperature and Salinity on Cadmium Uptake by the Blue Crab, Callinectes sapidus,
W75-10448 5C

Persistence of Cadmium-Induced Metabolic Changes in Liver and Kidney,
W75-10478 5A

Characterization of Cadmium Uptake by Plant Tissue,
W75-10479 5B

Absorption of Cadmium, Copper and Zinc by Dog Whelks in the Bristol Channel,
W75-10481 5B

The Concentration of Mercury, Copper, Nickel, Silver, Cadmium and Lead in the Northern Adriatic Anchovy, Engraulis Encrasicholus, and Sardine, Sardina Pilchardus,
W75-10620 5B

Combined Effects of Cadmium and Salinity on Development and Survival of Herring Eggs,
W75-10704 5C

CAGED CATFISH
Essentiality of Vitamin C in Feeds for Intensively Fed Caged Channel Catfish,
W75-10362 8I

CALIFORNIA
Evaluation of Ground Water Resources: Sacramento County,
W75-10546 2F

Map of the Antelope Valley-East Kern Water Agency Area, California, Showing Ground-Water Subunits and Areas, Location of Wells, and Water-Level Contours for Spring 1974,
W75-10595 7C

Problems Related to Water Quality and Algal Control in Lopez Reservoir, San Luis Obispo County, California,
W75-10601 5B

Los Angeles and Long Beach Harbors Model Study; Report 2, Observations of Ship Mooring and Movement,
W75-10664 8B

Flood Control Project on Lytle and Warm Creeks and Santa Ana River, California; Hydraulic Model Investigation,
W75-10668 8B

Development of Large Scale Drip Irrigation Systems,
W75-10784 3F

Some Factors Affecting Control of Flow in a Large Canal System,
W75-10786 8B

Automation of an Existing Irrigation System - Part I,
W75-10788 8C

Evaluation of Agricultural Drainage in Water Quality Management,
W75-10796 5G

CALIFORNIA WATER PROJECT
Some Factors Affecting Control of Flow in a Large Canal System,
W75-10786 8B

CANADA
Temperature-Induced Changes in Acute Toxicity of Zinc to Atlantic Salmon (Salmo salar),
W75-10431 5C

Resource Development in Canada's High Arctic,
W75-10463 2C

Snow Creep: Its Engineering Problems and Some Techniques and Results of Its Investigation,
W75-10503 2C

Measurement of Hydraulic Conductivity of Peats,
W75-10536 7B

Glacier-Flow Patterns and the Origin of Late Wisconsinan Till in the Southern Rocky Mountain Trench, British Columbia,
W75-10539 2C

Nonlinear Channel Routing by Computer,
W75-10543 4A

International Field Year for the Great Lakes.
W75-10547 2H

International Field Year for the Great Lakes.
W75-10548 2H

International Field Year for the Great Lakes.
W75-10549 2H

International Field Year for the Great Lakes.
W75-10550 2H

An Effluent Study of a Fresh Water Fish Processing Plant,
W75-10684 5D

The Master Plan for Water-Supply in the Regional Municipality of Ottawa-Carleton,
W75-10710 3D

Disposal of Used Crankcase and Other Oils in Canada,
W75-10743 5D

CANALS
Additional Studies of the Fishes, Macroinvertebrates and Hydrological Conditions of Upland Canals in Tampa Bay, Florida,
W75-10617 5C

Rivers in the City,
W75-10723 6B

The Perimeter Canal - A New Approach to Discharge Urban Water into a Coastal Mangrove Area,
W75-10773 4A

Some Factors Affecting Control of Flow in a Large Canal System,
W75-10786 8B

CANNELTON LOCKS AND DAM (IND)
Navigation Conditions at Cannelton Locks and Dam, Ohio River; Hydraulic Model Investigation,
W75-10667 8B

CANOPY
Canopy Weight Distribution Affects Windspeed and Temperature in a Lodgepole Pine Forest,
W75-10654 4A

CAPE CORAL (FLA)
The Perimeter Canal - A New Approach to Discharge Urban Water into a Coastal Mangrove Area,
W75-10773 4A

CAPITAL COSTS
Process Design Manual for Sludge Treatment and Disposal.
W75-10475 5D

CARASSIUS AURATUS
Effect of Water Hardness on the Toxicity of a Nonionic Detergent to Fish,
W75-10444 5C

CARBOHYDRATES
Effects of Acute Exposure to Bleached Kraft Pulp Mill Effluent on Carbohydrate Metabolism of Juvenile Coho Salmon (Oncorhynchus Kisutch) During Rest and Exercise,
W75-10388 5C

CARBON CYCLE
Decrease of Net Carbon Flux in Two Species of Mussels Caused by Extracts of Crude Oil,
W75-10433 5C

CARBON DIOXIDE
Importance of Plants in Oxygen Production, Carbon Dioxide Consumption and Air Purification,
W75-10715 2I

CARBON FLUX
Decrease of Net Carbon Flux in Two Species of Mussels Caused by Extracts of Crude Oil,
W75-10433 5C

CARBON TETRACHLORIDE
Physiological Changes in the Serum and Hepatopancreas of Yellow Tail Injected with Carbon Tetrachloride, (In Japanese),
W75-10630 5C

CARP
Effects of pH on Toxicity of Antimycin to Fish,
W75-10450 5C

CASCADE RANGE
Watershed Behavior After Forest Fire in Washington,
W75-10790 4C

CATFISH
Inhibition of ATPases Acitivity in Channel Catfish Brain by Kepone(Trade Name) and its Reduction Product,
W75-10612 5C

CATIONS
Fast Separation of Tin (IV) From Tin (II) and From Numerous Metal Ions on Ion-Exchange Papers,
W75-10497 2K

CATOMA CREEK (ALABAMA)
Flood Plain Information: Catoma Creek, Vicinity of Montgomery, Alabama.
W75-10574 4A

CEDAR LAKE CREEK (TEX)
Effects of Surface Drainage on Stream Flow,
W75-10794 4A

CELLULOSE
Cellulose Degradation in Waste Water Treatment,
W75-10376 5D

Production of Microbial Protein From Waste Cellulose by Thermomonospora Fusca, A Thermophilic Actinomycete,
W75-10538 5C

CENTRIFUGATION
Closed Recycling System for Water Purification and Waste Reduction,
W75-10735 5D

CHALK AQUIFER
Hydraulic Behaviour of the Chalk Aquifer in the Yorkshire Wolds,
W75-10506 4B

CHANNEL CATFISH
Essentiality of Vitamin C in Feeds for Intensively Fed Caged Channel Catfish,
W75-10362 8I

Inhibition of ATPases Acitivity in Channel Catfish Brain by Kepone(Trade Name) and its Reduction Product,
W75-10612 5C

Growth Factors in the Fish Meal Components of Catfish Diets,
W75-10658 2I

CHANNEL EROSION
Channel Erosion Surveys Along Southern Segment of the Taps Route, Alaska, 1972 and 1973,
W75-10594 8B

CHANNEL FLOW
Nonlinear Channel Routing by Computer,
W75-10543 4A

CHANNEL IMPROVEMENT
Environmental Issues, Effects, and Solutions,
W75-10795 6G

CHANNELS
Evaluation of Three Side Channels and the Main Channel Border of the Middle Mississippi River as Fish Habitat,
W75-10451 5C

CHELATION
Suppression of Nitrogen Fixation by Blue-Green Alage in a Eutrophic Lake with Trace Additions of Copper,
W75-10480 5C

CHELON ENGELI
Critical Thermal Maxima of Three Species of Hawaiian Estuarine Fish: A Comparative Study,
W75-10426 5C

CHEMICAL ANALYSIS
A River-Quality Assessment of the Upper White River, Indiana,
W75-10600 5B

Water Analysis of River Waters in Kagawa (IX), Chemical Composition of the Aya Water Basin, (In Japanese),
W75-10841 2K

CHEMICAL OXYGEN DEMAND
Analytic Characterization of Sewer Loading by Spent Liquors of the Pulp Industry (Analytische Kennzeichung der Belastung der Vorfluter durch Ablaugen der Zellstoffindustrie),
W75-10381 5D

CHEMICAL PROPERTIES
Organic Matter in Natural Water and Water Treatment,
W75-10351 5B

CHEMICALS
A Theory of the Mass Transport of Previously Distributed Chemicals in a Water-Saturated Sorbing Porous Medium: 4. Distributions,
W75-10632 5B

ACTMO, An Agricultural Chemical Transport Model,
W75-10846 5B

CHICKASAWHAY RIVER (MS)
Special Flood Hazard Information Report: Chickasawhay River, Waynesboro, Wayne County, Mississippi.
W75-10569 4A

CHIRONOMUS TENTANS
Acute Toxicities of 3-Trifluoromethyl-4-Nitrophenol (TFM) and 2',5-Dichloro-4'-Nitrosalicylanilide (Bayer 73) to Larvae of the Midge (Chironomus Tentans),
W75-10698 5C

CHLAMYDOMONAS REINHARDII
The Effect of Some Heavy Metal Ions on Photosynthesis in a Freshwater Alga,
W75-10627 5C

CHLORAMINES
Water Quality Criteria for European Freshwater Fish.
W75-10609 5C

CHLORBROMURON
Adsorption and Degradation of Chlorbromuron in Soil,
W75-10414 5B

CHLORIDE CELLS
X-ray Microanalysis of Zinc and Iron in the Cheloride Cells of Mayfly Larvae of the River Sulz, (Rontgenmikroanalyse von Zink und Eisen in Chloridzellen von Eintagsfligenlarven aus der Sulz),
W75-10416 5A

CHLORINATED HYDROCARBON PESTICIDES
Effects of Mirex on the Larval Development of Blue Crab,
W75-10410 5C

Effects of Heavy Metals and Pesticides on the Mass Mortalities of Cultured Shellfishes Along the Southwest Coast of Taiwan, (In Chinese),
W75-10427 5C

Effects of Chlorinated Hydrocarbon Pollutants on Growth of Marine Phytoplankton in Culture,
W75-10636 5C

CHLORINATED HYDROCARBONS
Toxic Effects of Aliphatic Chlorinated by-Products from Vinyl Chloride Production on Marine Animals,
W75-10412 5C

CHLORINATION
Toxic Effects of Aliphatic Chlorinated by-Products from Vinyl Chloride Production on Marine Animals,
W75-10412 5C

Toxicity of Chlorinated Municipal Wastes to Fish: An Evaluation Based on Michigan Field Data,
W75-10680 5C

CHLORINE
Water Quality Criteria for European Freshwater Fish.
W75-10609 5C

CHLOROPHYTA
Effect of a Phytoplankton Culture on the Germination and Seedling Development of Barley, Sugar Beets and Lettuce,
W75-10496 3F

The Effect of the Quantity of Silt to the Attached Microorganisms of the Kuzuryu-Gawa River in the Hokuriku District, (In Japanese),
W75010696 5C

CHRISTINA RIVER (DE)
Flood Plain Information: White Clay Creek, New Castle County, Delaware.
W75-10571 4A

CHROMATOGRAPHY
Fast Separation of Tin (IV) From Tin (II) and From Numerous Metal Ions on Ion-Exchange Papers,
W75-10497 2K

CIRCULATION
Physical Model Study of Circulation Patterns in Lake Ontario,
W75-10537 2H

CITIES
Rivers in the City,
W75-10723 6B

CITY PLANNING
Valley Design in Urban Growth Centres,
W75-10643 6B

CLEANING
Serpaflo: Original Solution to Cleaning Paper Mill Effluents (Serpaflo; La solution originale d'epuration des eaux papeteries),
W75-10389 5D

Water Pollution Problems Associated with Control of Stack Gas Emission,
W75-10691 5B

CLIMATES
Protein Content of Winter Wheat Grain as Related to Soil and Climatic Factors in the Semi-Arid Central Great Plains,
W75-10792 3F

CLOUD SEEDING
Weather Modification for Use in the High Plains,
W75-10775 3B

Users' View of Weather Modification,
W75-10776 3B

Role of the Public in Weather Modification,
W75-10777 3B

CLOUDS
Priority Problems for Modifying Cumulus Precipitation,
W75-10774 3B

CLUPEA HARENGUS
Combined Effects of Cadmium and Salinity on Development and Survival of Herring Eggs,
W75-10704 5C

COAST GUARD REGULATIONS
Characteristics of Oil Pollution in and Around U.S. Waters,
W75-10754 5B

COASTAL PLAINS
Relationships Between Drouth and Corn Yields on Selected South Atlantic Coastal Plain Soils,
W75-10721 3F

COHO SALMON
Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) To Nontarget Fish in Flow- Through Tests,
W75-10702 5C

COLOR
Color of Pulp Industry Waste Liquors. (6). Behavior of Color During Waste Treatments (In Japanese),
W75-10393 5D

Color of Pulp Industry Waste Liquors. (7). Color Reduction by Ultraviolet Treatment (In Japanese),
W75-10394 5D

Color Removal From Bleached Kraft Effluents,
W75-10399 5D

COLORADO
Flood Plain Information: Goldsmith Gulch, Dutch Creek, Lilley Gulch, and Coon Creek, Volume VI, Denver Metropolitan Region, Colorado.
W75-10563 4A

Hydrologic Reconnaissance of the Southern Uinta Basin, Utah and Colorado,
W75-10585 3B

Effectiveness of Precipitation in a Mountain Meadow,
W75-10799 2D

COLORADO RIVER
The Lower Colorado River: A Bibliography,
W75-10453 10C

Wellton-Mohawk Drainage and the Mexican Salt Problem,
W75-10783 4A

Effect of Agricultural Use on Water Quality for Downstream Use for Irrigation,
W75-10805 5G

COMBINED SEWERS
Coping With Urban Runoff in the United States,
W75-10541 5D

COMMERCIAL FISHING
The Economic Impact of Mercury Pollution on Fisheries and Other Related Businesses Around Pickwick Lake,
W75-10356 5G

COMMERCIAL SHELLFISH
Effects of Heavy Metals and Pesticides on the Mass Mortalities of Cultured Shellfishes Along the Southwest Coast of Taiwan, (In Chinese),
W75-10427 5C

The Effects of Crude Oil on the Palatability of Marine Crustaceans,
W75-10428 5C

The Biological Half-Life of Inorganic Mercury in the Dungeness Crab (Cancer magister),
W75-10437 5C

COMPREHENSIVE PLANNING
The Master Plan for Water-Supply in the Regional Municipality of Ottawa-Carleton,
W75-10710 3D

COMPUTER MODELS
Land Use Simulation Model of the Subalpine Coniferous Forest Zone,
W75-10404 3B

Simulating Timber Yields and Hydrologic Impacts Resulting From Timber Harvest on Subalpine Watersheds,
W75-10406 3B

A Predictive Computer Model of the Lower Cretaceous Aquifer, Franklin Area, Southeastern Virginia,
W75-10599 2F

Analysis of a Large Water Distribution System Using Advanced Computer Software,
W75-10720 4A

Optimal Sizing of Urban Flood-Control Systems,
W75-10821 4A

Computer Simulation of Water Distribution Networks,
W75-10823 4A

Pipeline Stress Analysis,
W75-10824 8B

COMPUTER PROGRAMS
The Biological Half-Life of Inorganic Mercury in the Dungeness Crab (Cancer magister),
W75-10437 5C

Pipeline Stress Analysis,
W75-10824 8B

CONCRETE DAMS
Harry S. Truman Dam and Reservoir, Osage River, Missouri, Apendix A (Final Environmental Impact Statement).
W75-10363 8A

CONDUITS
Turbulent Flow in Rectangular Outlet Conduit, Rend Lake Dam, Big Muddy River, Illinois,
W75-10666 8B

CONFERENCES
Proceedings Symposium on Statistical Hydrology.
W75-10507 2A

Agricultural and Urban Considerations in Irrigation and Drainage.
W75-10769 4A

CONIFEROUS FORESTS
Land Use Simulation Model of the Subalpine Coniferous Forest Zone,
W75-10404 3B

CONJUNCTIVE USE
Groundwater Control by Pumping,
W75-10778 4B

CONNECTICUT
Hydrogeologic Data for the Farmington River Basin, Connecticut,
W75-10591 7C

CONSTRUCTION
Groundwater Protection in Highway Construction in the Catchment Area of the City of Berne at Kiesen (Grundwasserschutz beim Autobahn im Fassungsgebiet Stadt Bern in Kiesen),
W75-10837 5C

CONSTRUCTION MATERIALS
Corrosion and Its Cost in Sewage Treatment,
W75-10364 8G

CONTINENTAL SHELF
Wave Climate Model of the Mid-Atlantic Shelf and Shoreline (Virginian Sea), Model Development, Shelf Geomorphology, and Preliminary Results,
W75-10552 2L

COOLING PONDS
Nuclear Power Plant Cooling System Selection,
W75-10822 6C

COOLING SYSTEMS
Nuclear Power Plant Cooling System Selection,
W75-10822 6C

COOLING TOWER PLUMES
Environmental Problems Associated with the Use of Cooling Towers,
W75-10671 5D

COOLING TOWERS
Environmental Problems Associated with the Use of Cooling Towers,
W75-10671 5D

COOLING WATER
Nuclear Power Plant Cooling System Selection,
W75-10822 6C

COPEPODS
The Effect of Crude Oil Fractions on the Survival of a Tidepool Copepod, Tigriopus Californicus,
W75-10641 5C

COPPER
Determination of Cadmium, Copper, and Lead in Natural Waters After Anion-Exchange Separation,
W75-10385 5A

Heavy Metal Contents of Fishes Caught in Kaohsiung Harbor, (In Chinese),
W75-10430 5A

Response of Freshwater Protozoan Artificial Communities to Metals,
W75-10440 5C

Suppression of Nitrogen Fixation by Blue-Green Alage in a Eutrophic Lake with Trace Additions of Copper,
W75-10480 5C

Absorption of Cadmium, Copper and Zinc by Dog Whelks in the Bristol Channel,
W75-10481 5B

Spectroscopic Determination of Atomization Efficiency (CuCl-Cu+Cl) in an Air-Hydrogen Flame,
W75-10498 2K

Copper, Zinc and Total Protein Levels in the Plasma of Sockeye Salmon (Oncorhynchus Nerka) During Their Spawning Migration,
W75-10613 5C

The Concentration of Mercury, Copper, Nickel, Silver, Cadmium and Lead in the Northern Adriatic Anchovy, Engraulis Encrasicholus, and Sardine, Sardina Pilchardus,
W75-10620 5B

The Effect of Sublethal Concentrations of Copper and Zinc on Ventilatory Activity, Blood Oxygen, and pH in Rainbow Trout (Salmo Gairdneri),
W75-10624 5C

The Effect of Certain Organic Pollutants on Copper Toxicity to Fish (Lebistes Reticulatus),
W75-10637 5C

COPPER SULFATE
Herbicides in Aquatic Systems,
W75-10625 5C

CORAL
Arsenate Uptake and Reduction by Pocillopora verrucosa,
W75-10491 5C

CORN (FIELD)
Phosphorus in Percolates from Manured Lysimeters,
W75-10573 5B

Relationships Between Drouth and Corn Yields on Selected South Atlantic Coastal Plain Soils,
W75-10721 3F

CORRELATION ANALYSIS
General Aspects of Multivariate Analysis with Applications to Some Problems in Hydrology,
W75-10510 2A

CORROSION
Corrosion and Its Cost in Sewage Treatment,
W75-10364 8G

Deterioration of Water Quality in Distribution Systems,
W75-10711 5F

CORTICOSTEROIDS
Corticosteroid Concentrations in Sockeye Salmon (Oncorhynchus Nerka) Exposed to Low Concentrations of Copper,
W75-10415 5C

COST ANALYSIS
Analysis of Reservoir Recreation Benefits,
W75-10826 6B

COST-BENEFIT RATIO
Review of the Economic Benefits and Costs Resulting from Dewey Reservoir,
W75-10828 6B

COST-EFFECTIVENESS
Nuclear Power Plant Cooling System Selection,
W75-10822 6C

COST REPAYMENT
Analyzing Reimbursement Mechanisms for Resource Development Projects,
W75-10353 6C

COSTS
Process Design Manual for Upgrading Existing Waste Water Treatment Plants.
W75-10396 5D

An Economic Model of Waste Oil Recovery, Reprocessing and Distribution Systems,
W75-10768 5D

COTTON
Some Effects of Field Weathering of Seed Cotton in a Desert Environment,
W75-10557 3F

COTTON (FIELD)
Effects of Soil Moisture on Stress on 2 Varieties of Upland Cotton in Israel: IV. Effects of Periods of Stress Occurrence, Correlations and Regressions,
W75-10791 3F

CRABS
Effects of Mirex on the Larval Development of Blue Crab,
W75-10410 5C

The Biological Half-Life of Inorganic Mercury in the Dungeness Crab (Cancer magister),
W75-10437 5C

The Effect of Temperature and Salinity on Cadmium Uptake by the Blue Crab, Callinectes sapidus,
W75-10448 5C

CRAYFISH
Toxicity and Residue Dynamics of the Lampricide 3-Trifluoro-Methyl-4-Nitrophenol (TFM) in Aquatic Invertebrates,
W75-10700 5C

CROP PRODUCTION
Responses of 'Bearss' Lemon to Nitrogen, Potassium and Irrigation Applications,
W75-10714 3F

Flooding and Soil Temperature Effects on Wheat During Grain Filling,
W75-10829 3F

CROPS
Utilization of Sewage Effluent for Irrigation,
W75-10798 5D

Trickle Irrigation Design Requirements for Row Crops,
W75-10801 3F

CROSS-SPECTRAL ANALYSIS
Cross Spectra of Short-Duration Rainfall,
W75-10514 2B

CRUDE OIL
The Effects of Crude Oil on the Palatability of Marine Crustaceans,
W75-10428 5C

CRUSTACEANS
The Effects of Crude Oil on the Palatability of Marine Crustaceans,
W75-10428 5C

CUMULUS PRECIPITATION
Priority Problems for Modifying Cumulus Precipitation,
W75-10774 3B

CURRENT VELOCITY
Norton Point Dike Study, Coney Island, New York; Hydraulic Model Investigation,
W75-10662 8B

CURVE FITTING
A Note on Mixed Distributions in Hydrology,
W75-10527 2E

A Two-Distribution Method for Fitting Mixed Distributions in Hydrology,
W75-10531 2E

CYANOPHYTA
Suppression of Nitrogen Fixation by Blue-Green Alage in a Eutrophic Lake with Trace Additions of Copper,
W75-10480 5C

The Effect of the Quantity of Silt to the Attached Microorganisms of the Kuzuryu-Gawa River in the Hokuriku District, (In Japanese),
W75010696 5C

CYLOLOGICAL STUDIES
Electron Microscope Autoradiography of Kidney After Administration of PB-210 in Mice,
W75-10476 5A

CYTOLOGICAL STUDIES
An Analysis of the Mechanics of Guard Cell Motion,
W75-10488 2I

DAIRY INDUSTRY
Treatment of Milk Truck Washing Wastes by Anerobic Digestion,
W75-10673 5D

DALAPON
Herbicides in Aquatic Systems,
W75-10625 5C

DAM CONSTRUCTION
Project Lost Creek: Field Tests of Mounding and Controlled Blasting,
W75-10553 8H

DAMS
Navigation Conditions at Cannelton Locks and Dam, Ohio River; Hydraulic Model Investigation,
W75-10667 8B

DAPHNIA
Toxicity and Residue Dynamics of the Lampricide 3-Trifluoro-Methyl-4-Nitrophenol (TFM) in Aquatic Invertebrates,
W75-10700 5C

DATA COLLECTIONS
Index to Water Resources Data for Louisiana: Surface Water Records; Water-Quality Records.
W75-10590 5A

DATA EXTENSION
Developing Regional Stochastic Data Bases,
W75-10528 2E

DDE
Uptake of Three Polychlorinated Biphenyls, DDT and DDE by the Green Sunfish, Lepomis Cyanellus Raf.,
W75-10422 5C

DDT
Uptake of Three Polychlorinated Biphenyls, DDT and DDE by the Green Sunfish, Lepomis Cyanellus Raf.,
W75-10422 5C

DDT : Short Term Effects on Osmoregulation in Black Surfperch (Embiotoca Jacksoni),
W75-10429 5C

Residues of Polychlorinated Biphenyls (PCB) and Chlorinated Pesticides in Fish and Birds of the Po Delta, (Residus de Polychlorobiphenyls (PCB) et de Pesticides Chlores Dans Les Poissons et Les Oiseaux du Delta du Po),
W75-10446 5B

Effects of Chlorinated Hydrocarbon Pollutants on Growth of Marine Phytoplankton in Culture,
W75-10636 5C

DECISION MAKING
Derived Decision Rules for Pollution Control in a General Equilibrium Space Economy,
W75-10360 6C

Weather Modification for Use in the High Plains,
W75-10775 3B

Comments on the Straw Man,
W75-10808 6B

Report to the Technical Committee of the Water Resources Centers of the Thirteen Western States,
W75-10809 6B

Nuclear Power Plant Cooling System Selection,
W75-10822 6C

DEER CREEK (SD)
Flood Plain Information: Brookings, Brookings County, South Dakota, Volume I - Deer Creek.
W75-10570 4A

DEFLECTION DIKES
Norton Point Dike Study, Coney Island, New York; Hydraulic Model Investigation,
W75-10662 8B

DELAWARE
Flood Plain Information: White Clay Creek, New Castle County, Delaware.
W75-10571 4A

DELAWARE RIVER
Report on the River Master of the Delaware River for the Period December 1, 1973-November 30, 1974,
W75-10589 4A

DELAWARE RIVER BASIN COMMISSION
Report on the River Master of the Delaware River for the Period December 1, 1973-November 30, 1974,
W75-10589 4A

DEMINERALIZATION
Treatment Processes for Coping with Variation in Raw-Water Quality,
W75-10705 5F

DEODORISATION
Treatment of Service Water with Ozone,
W75-10840 5D

DEPENDABLE SUPPLY
Water Supply from Renovated Wastewater--A Resource Manual for Massachusetts Planners, Public Officials and Citizen Groups.
W75-10722 5D

DES MOINES RIVER (IA)
Five Year Study of Des Moines River Water Quality,
W75-10803 5B

DESALINATION
Liquefying Refrigerant for Water Desalination with Liquefied Natural Gas and an Intermediate Energy Cycle,
W75-10725 3A

Rotary Desalination Engine and System,
W75-10733 3A

DESALINATION APPARATUS
Rotary Desalination Engine and System,
W75-10733 3A

DESALINATION PROCESSES
Liquefying Refrigerant for Water Desalination with Liquefied Natural Gas and an Intermediate Energy Cycle,
W75-10725 3A

DESERTS
Geological and Limnological Factors of Cold Deserts,
W75-10457 2C

DESIGN
Multichannel Toxicant Injection System for Flow-Through Bioassays,
W75-10443 5A

Analysis of Wastewater Treatment Systems for a Meat Processing Plant,
W75-10687 5D

A Gravity-Flow Column to Provide Pesticide-Laden Water for Aquatic Bioassays,
W75-10844 5A

DESIGN CRITERIA
Corrosion and Its Cost in Sewage Treatment,
W75-10364 8G

Process Design Manual for Sludge Treatment and Disposal.
W75-10475 5D

New Engineering Criteria for Snow Fence Systems,
W75-10692 2C

Water Quality Factors in Designing a Sewage Plant Based on Public Drainage Statistical Data, (In Japanese),
W75-10838 5D

DETERGENTS
Toxic Effects of an Anionic Detergent on the Gills of Rainbow Trout,
W75-10434 5C

Effect of Water Hardness on the Toxicity of a Nonionic Detergent to Fish,
W75-10444 5C

Absorption, Metabolism, and Excretion by Goldfish of the Anionic Detergent Sodium Lauryl Sulphate,
W75-10626 5C

DETERIORATION
Deterioration of Water Quality in Distribution Systems,
W75-10711 5F

DETOXIFICATION
Effects of pH on Toxicity of Antimycin to Fish,
W75-10450 5C

DEWATERING
Gravity Dewatering of Metal Hydroxide Sludges,
W75-10500 5D

DIATOMS
The Effect of Heavy Metals on Photosynthesis and Loss of Cell Potassium in Two Species of Marine Algae, Dunaliella tertiolecta and Phaeodactylum tricornutum,
W75-10447 5C

The Effect of the Quantity of Silt to the Attached Microorganisms of the Kuzuryu-Gawa River in the Hokuriku District, (In Japanese),
W75010696 5C

DIELDRIN
Residues of Polychlorinated Biphenyls (PCB) and Chlorinated Pesticides in Fish and Birds of the Po Delta, (Residus de Polychlorobiphenyls (PCB) et de Pesticides Chlores Dans Les Poissons et Les Oiseaux du Delta du Po),
W75-10446 5B

DIFFUSION
Prediction of Trifluralin Diffusion Coefficients,
W75-10542 5B

DIKES
Norton Point Dike Study, Coney Island, New York; Hydraulic Model Investigation,
W75-10662 8B

DISAGGREGATION
A Method of Disaggregation,
W75-10817 6A

DISCHARGE (WATER)
Organic Compounds in Pulp Mill Lagoon Discharge,
W75-10402 5D

DISPERSION
Dispersion of Contaminated Bedload Particles,
W75-10526 5B

DISSOLVED OXYGEN
Plant Performance Using Dissolved Oxygen Control,
W75-10452 5D

Additional Studies of the Fishes, Macroinvertebrates and Hydrological Conditions of Upland Canals in Tampa Bay, Florida,
W75-10617 5C

DISTRIBUTION
Redistribution and Concentration of Mercury in the Environment,
W75-10483 5B

On the Joint Distribution of the Periods and Amplitudes of Sea Waves,
W75-10534 2L

A Theory of the Mass Transport of Previously Distributed Chemicals in a Water-Saturated Sorbing Porous Medium: 4. Distributions,
W75-10632 5B

DISTRIBUTION FUNCTIONS
Some Problems in Pure and Applied Stochastic Hydrology,
W75-10508 2A

DISTRIBUTION PATTERNS
Comments on the Statistical Distribution of Rainfall per Period Under Various Transformations,
W75-10517 2B

DISTRIBUTION SYSTEMS
The Master Plan for Water-Supply in the Regional Municipality of Ottawa-Carleton,
W75-10710 3D

Deterioration of Water Quality in Distribution Systems,
W75-10711 5F

Water Works Improvements--Springfield, Vermont,
W75-10713 3D

Analysis of a Large Water Distribution System Using Advanced Computer Software,
W75-10720 4A

DISTRICT OF COLUMBIA
Population Dynamics of Protozoa in Wastewater, and Impact of Environmental Changes,
W75-10689 5D

DIVERSION
Toward an Ice-Free Arctic Ocean,
W75-10532 2C

DOBSON SPECTROPHOTOMETER
Error Analysis of Dobson Spectrophotometer Measurements of the Total Atmospheric Ozone Content,
W75-10545 7B

DOG WHELKS
Absorption of Cadmium, Copper and Zinc by Dog Whelks in the Bristol Channel,
W75-10481 5B

DOMESTIC WASTES
Domestic Waste Water Reuse--Aspects of the Treatment System,
W75-10708 5D

DRAINAGE
Agricultural and Urban Considerations in Irrigation and Drainage.
W75-10769 4A

Drainage Analysis of a Confining Formation,
W75-10780 4A

Wellton-Mohawk Drainage and the Mexican Salt Problem,
W75-10783 4A

Effect of Agricultural Use on Water Quality for Downstream Use for Irrigation,
W75-10805 5G

DRAINAGE ENGINEERING
Art of Agricultural Drainage Design and Costs,
W75-10797 4A

DRAINAGE PRACTICES
Hydrology of the Albemarle-Pamlico Region, North Carolina--A Preliminary Report on the Impact of Agricultural Developments,
W75-10602 4C

Effects of Farming - Urban Drainage on Fresh Water,
W75-10802 5G

DRAINAGE SYSTEMS
Art of Agricultural Drainage Design and Costs,
W75-10797 4A

DRAINAGE WELLS
Change in Quality of Pumped Drainage Effluent,
W75-10779 5B

DRILLING
Icebreaking Drillship for Offshore Exploratory Drilling in the Arctic,
W75-10639 5G

DRIP IRRIGATION
Development of Large Scale Drip Irrigation Systems,
W75-10784 3F

DROUGHT RESISTANCE
Relationships Between Drouth and Corn Yields on Selected South Atlantic Coastal Plain Soils,
W75-10721 3F

DROUGHT TOLERANCE
Relationships Between Drouth and Corn Yields on Selected South Atlantic Coastal Plain Soils,
W75-10721 3F

DROUGHTS
Recurrence Intervals of Annual Minimum Streamflows,
W75-10530 2E

DUAL WATER SUPPLY SYSTEMS
Water Supply from Renovated Wastewater--A Resource Manual for Massachusetts Planners, Public Officials and Citizen Groups.
W75-10722 5D

DUNALIELLA TERTIOLECTA
The Effect of Heavy Metals on Photosynthesis and Loss of Cell Potassium in Two Species of Marine Algae, Dunaliella tertiolecta and Phaeodactylum tricornutum,
W75-10447 5C

DUNGENESS CRAB
The Biological Half-Life of Inorganic Mercury in the Dungeness Crab (Cancer magister),
W75-10437 5C

DYE DISPERSION
Norton Point Dike Study, Coney Island, New York; Hydraulic Model Investigation,
W75-10662 8B

EAST FORK ONE HUNDRED AND TWO RIVER (IA)
Flood Plain Information: East Fork One Hundred and Two River, Bedford, Iowa.
W75-10566 4A

ECOLOGICAL DISTRIBUTION
Fishes of the Hiwassee River System: Ecological and Taxonomic Considerations,
W75-10694 5C

An Investigation of the Ecology and Water Quality of a Lake Outlet,
W75-10724 5C

ECONOMETRICS
The Effect of Landowner Attitude on the Financial and the Economic Costs of Acquiring Land for a Large Public Works Project,
W75-10827 6B

ECONOMIC EFFICIENCY
Water Rates: An Assessment of Current Issues,
W75-10707 6C

ECONOMIC IMPACT
Analyzing Reimbursement Mechanisms for Resource Development Projects,
W75-10353 6C

The Economic Impact of Mercury Pollution on Fisheries and Other Related Businesses Around Pickwick Lake,
W75-10356 5G

International Production Aspects of Water and Environmental Quality Control,
W75-10357 5G

Industrial Interdependencies and External Diseconomies of Water Resources,
W75-10358 6B

ECOSYSTEMS
Evaluation of Three Side Channels and the Main Channel Border of the Middle Mississippi River as Fish Habitat,
W75-10451 5C

Herbicides in Aquatic Systems,
W75-10625 5C

Problems of Water Quality Management in Western River Basin Systems,
W75-10804 5G

EFFICIENCIES
Increasing the Efficiency of Flotation Savealls (Povyshenie effektivnosti raboty flotatsionnykh lovushek),
W75-10369 5D

EFFLUENT GUIDELINES
EPA's Effluent Guidelines Have Their Day in Court.
W75-10470 5G

EFFLUENTS
Effluent Treatment Equipment.
W75-10832 5D

EGALITARIANISM
Egalitarianism,
W75-10818 6A

ELASTICITY OF DEMAND
On the Peak-Load Pricing of Urban Water Supply,
W75-10706 6C

ELECTROLYSIS
Method of Purification of Waste Water Produced From the Packing of Meat and Aquatic Animals,
W75-10737 5D

EMBRYONIC GROWTH STAGE
Acute Toxicity of Ammonia to Several Developmental, Stages of Rainbow Trout, Salmo Gairdneri,
W75-10619 5C

Effects of Temperature on Development and Survival of Rainbow Trout, Salmo Gairdneri, in Acid Waters,
W75-10623 5C

ENGINEERING STRUCTURES
Effects of Surface Drainage on Stream Flow,
W75-10794 4A

Environmental Issues, Effects, and Solutions,
W75-10795 6G

ENTEROVIRUSES
Sensitivity of Human Diploid Embryonic Lung Cells from Isolation of Echo Viruses from Sewage,
W75-10836 5C

ENTIAT EXPERIMENTAL FOREST (WASH)
Watershed Behavior After Forest Fire in Washington,
W75-10790 4C

ENVIRONEMTNAL IMPACT STATEMENTS
Harry S. Truman Dam and Reservoir, Osage River, Missouri, Apendix A (Final Environmental Impact Statement).
W75-10363 8A

ENVIRONMENT
Principles and standards for Water Planning,
W75-10355 6B

ENVIRONMENTAL CONTROL
Rivers in the City,
W75-10723 6B

ENVIRONMENTAL EFFECTS
Harry S. Truman Dam and Reservoir, Osage River, Missouri, Apendix A (Final Environmental Impact Statement).
W75-10363 8A

Effects of Methylmercury on Approach and Avoidance Behavior of Mallard Ducklings,
W75-10424 5C

Toxicity of Two Synthetic Pyrethrins to Brown Trout,
W75-10438 5C

Manual for Preparation of Environmental Impact Statements for Wastewater Treatment Works, Facilities Plans, and 208 Areawide Waste Treatment Management Plans,
W75-10473 5D

Additional Studies of the Fishes, Macroinvertebrates and Hydrological Conditions of Upland Canals in Tampa Bay, Florida,
W75-10617 5C

800 Miles to Go,
W75-10638 5C

Effects of an Offshore Crude Oil Unloading Terminal on the Marine Environment,
W75-10642 5C

Environmental Problems Associated with the Use of Cooling Towers,
W75-10671 5D

Population Dynamics of Protozoa in Wastewater, and Impact of Environmental Changes,
W75-10689 5D

Environmental Issues, Effects, and Solutions,
W75-10795 6G

ENVIRONMENTAL ENGINEERING
Plant Performance Using Dissolved Oxygen Control,
W75-10452 5D

ENVIRONMENTAL IMPACT STATEMENTS
Manual for Preparation of Environmental Impact Statements for Wastewater Treatment Works, Facilities Plans, and 208 Areawide Waste Treatment Management Plans,
W75-10473 5D

Nuclear Power Plant Cooling System Selection,
W75-10822 6C

ENZYMES
Inhibition of ATPases Acitivity in Channel Catfish Brain by Kepone(Trade Name) and its Reduction Product,
W75-10612 5C

Physiological Changes in the Serum and Hepatopancreas of Yellow Tail Injected with Carbon Tetrachloride, (In Japanese),
W75-10630 5C

EPHEMERAL STREAMS
A Stochastic Model of Sediment Yield for Ephemeral Streams,
W75-10524 2J

EPIDEMIOLOGY
Sensitivity of Human Diploid Embryonic Lung Cells from Isolation of Echo Viruses from Sewage,
W75-10836 5C

EQUIPMENT
Effluent Treatment Equipment.
W75-10832 5D

ESTIMATING FLOOD PEAKS
A Comparison of Methods for Estimating Flood Peaks on Streams in Massachusetts,
W75-10587 4A

ESTUARIES
Critical Thermal Maxima of Three Species of Hawaiian Estuarine Fish: A Comparative Study,
W75-10426 5C

ETHOXYLATE DETERGENTS
Effect of Water Hardness on the Toxicity of a Nonionic Detergent to Fish,
W75-10444 5C

EUROPE
New Legislative Tendencies for Control of Water Pollution (Nuevas tendencias legislativas en el control de la contaminacion de las aguas),
W75-10384 5G

EUTROPHICATION
Suppression of Nitrogen Fixation by Blue-Green Alage in a Eutrophic Lake with Trace Additions of Copper,
W75-10480 5C

Will Wastewater Treatment Stop Eutrophication of Impoundments,
W75-10686 5D

An Investigation of the Ecology and Water Quality of a Lake Outlet,
W75-10724 5C

EVALUATION
Theoretical and Applied Concepts of Water Resources for Social Welfare.
W75-10354 6B

Development of Large Scale Drip Irrigation Systems,
W75-10784 3F

Panel Review of the Taxonomic Structure of the Straw Man.
W75-10806 6B

Panel Evaluation of the Logical Structure, Consistency, and Underlying Assumptions of the 'Strawman' Methodology.
W75-10807 6B

Comments on the Straw Man,
W75-10808 6B

Report to the Technical Committee of the Water Resources Centers of the Thirteen Western States,
W75-10809 6B

Proceedings of the Graduate Student Symposium of the Technical Committee of the Water Resources Centers of the Thirteen Western States.
W75-10810 6A

Qualitative Sign Matrix Manipulation,
W75-10815 6A

A Method of Disaggregation,
W75-10817 6A

EVAPORATION
A Climatological Analysis of North Polar Desert Areas,
W75-10455 2C

Estimating the Transport and Evaporation of Blowing Snow,
W75-10695 2C

EVAPORATOR CONDENSATES
Studies on Possibilities of Biochemical Purification of Evaporator Condensate Occurring During Sulfite Pulp Manufacture (Untersuchungen ueber die Moeglichkeit der biochemischen Reinigung des bei der Sulfitzellstoffherstellung anfallenden Eindampfkondensates),
W75-10382 5D

EVAPOTRANSPIRATION
Effectiveness of Precipitation in a Mountain Meadow,
W75-10799 2D

EXCAVATION
Project Lost Creek: Field Tests of Mounding and Controlled Blasting,
W75-10553 8H

Results of Airblast Overpressure Measurement Program at Project R.D. Bailey,
W75-10555 8H

EXCHANGE RATES
Theoretical and Applied Concepts of Water Resources for Social Welfare.
W75-10354 6B

International Production Aspects of Water and Environmental Quality Control,
W75-10357 5G

EXPLOSIONS
Results of Airblast Overpressure Measurement Program at Project R.D. Bailey,
W75-10555 8H

EXTERNALITIES
Theoretical and Applied Concepts of Water Resources for Social Welfare.
W75-10354 6B

International Production Aspects of Water and Environmental Quality Control,
W75-10357 5G

Industrial Interdependencies and External Diseconomies of Water Resources,
W75-10358 6B

FALLING CREEK (VA)
Flood Plain Information: Falling Creek, Chesterfield County, Virginia.
W75-10577 4A

FARM WASTES
Phosphorus in Percolates from Manured Lysimeters,
W75-10573 5B

FARMINGTON RIVER BASIN (CONN)
Hydrogeologic Data for the Farmington River Basin, Connecticut,
W75-10591 7C

FEASIBILITY STUDIES
Lake Erie International Jetport Model Feasibility Investigation, Physical Model Feasibility Study,
W75-10670 8B

FEDERAL JURISDICTION
Manual for Preparation of Environmental Impact Statements for Wastewater Treatment Works, Facilities Plans, and 208 Areawide Waste Treatment Management Plans,
W75-10473 5D

Program for Control of Discharges of Pollutants to Navigable Waters.
W75-10608 5G

FEDERAL WATER POLLUTION CONTROL ACT
P. L. 92-500 (Two Years Later) is Not the Answer,
W75-10471 5G

The Laws and Their Enforcement; Progress Amidst Problems,
W75-10607 5G

FENITROTHION
Toxicity of Phosphamidon to American Lobsters (Homarus Americanus) Held at 4 and 12C,
W75-10413 5C

FERTILIZERS
Responses of 'Bearss' Lemon to Nitrogen, Potassium and Irrigation Applications,
W75-10714 3F

FILTERS
Automatic Device for the Operational Control of the Filtration Rate of Suspensions(Automatische Vorrichtung zur Technischen Kontrolle der Filtrationsgeschwindigkeit von Suspensionen),
W75-10830 5D

FILTRATION
Vacuum Filtration Cost Optimization,
W75-10681 5D

Automatic Device for the Operational Control of the Filtration Rate of Suspensions(Automatische Vorrichtung zur Technischen Kontrolle der Filtrationsgeschwindigkeit von Suspensionen),
W75-10830 5D

FINANCING
Financing Water Works,
W75-10712 3D

FINGERLINGS
Toxicity of Two Synthetic Pyrethrins to Brown Trout,
W75-10438 5C

FISH
Toxicity of Pulping Wastes to Fish,
W75-10403 5C

Effect of a Mixture of Succinic Acid Mono-Sulpho-Ester and Olefin Sulfonate on Fish (Uber die Wirkung einer Mischung von Sulfobernsteinsaure-halbester und Olefinsulfonat auf Fische),
W75-10409 5C

Critical Thermal Maxima of Three Species of Hawaiian Estuarine Fish: A Comparative Study,
W75-10426 5C

Residues of Polychlorinated Biphenyls (PCB) and Chlorinated Pesticides in Fish and Birds of the Po Delta, (Residus de Polychlorobiphenyls (PCB) et de Pesticides Chlores Dans Les Poissons et Les Oiseaux du Delta du Po),
W75-10446 5B

Water Quality Criteria for European Freshwater Fish.
W75-10609 5C

Inhibition of ATPases Acitivity in Channel Catfish Brain by Kepone(Trade Name) and its Reduction Product,
W75-10612 5C

Herbicides in Aquatic Systems,
W75-10625 5C

Fishes of the Hiwassee River System: Ecological and Taxonomic Considerations,
W75-10694 5C

FISH BEHAVIOR
Water Quality Criteria for European Freshwater Fish.
W75-10610 5C

FISH CONTROL AGENTS
Effects of pH on Toxicity of Antimycin to Fish,
W75-10450 5C

FISH DIETS
Growth Factors in the Fish Meal Components of Catfish Diets,
W75-10658 2I

FISH DISEASES
Acute Toxicity of Kanamycin to Steelhead Trout (Salmo Gairdneri),
W75-10423 5C

FISH DIVERSITY
Fishes of the Hiwassee River System: Ecological and Taxonomic Considerations,
W75-10694 5C

FISH EGGS
Some Observations on Spawning of Brook Trout (Salvelinus Fontinalis Mitchill) in Lime Neutralized Iron Hydroxide Suspensions,
W75-10445 5C

Combined Effects of Cadmium and Salinity on Development and Survival of Herring Eggs,
W75-10704 5C

FISH MIGRATION
Copper, Zinc and Total Protein Levels in the Plasma of Sockeye Salmon (Oncorhynchus Nerka) During Their Spawning Migration,
W75-10613 5C

FISH PHYSIOLOGY
Studies on the Metabolism of Chlorophenols in Fish-I Absorption and Excretion of PCP by Goldfish,
W75-10417 5C

Studies on the Metabolism of Chlorophenols in Fish-II Turnover in Absorbed PCP in Goldfish,
W75-10418 5C

DDT : Short Term Effects on Osmoregulation in Black Surfperch (Embiotoca Jacksoni),
W75-10429 5C

Toxic Effects of an Anionic Detergent on the Gills of Rainbow Trout,
W75-10434 5C

The Concentration of Mercury, Copper, Nickel, Silver, Cadmium and Lead in the Northern Adriatic Anchovy, Engraulis Encrasicholus, and Sardine, Sardina Pilchardus,
W75-10620 5B

Toxaphene Effects on Growth and Development of Brook Trout (Salvelinus Fontinalis),
W75-10621 5C

The Effect of Sublethal Concentrations of Copper and Zinc on Ventilatory Activity, Blood Oxygen, and pH in Rainbow Trout (Salmo Gairdneri),
W75-10624 5C

Absorption, Metabolism, and Excretion by Goldfish of the Anionic Detergent Sodium Lauryl Sulphate,
W75-10626 5C

Influence of a Thermal Effluent on Movement of Brown Bullhead (Ictalurus Nebulosus) as Determined by Ultrasonic Tracking,
W75-10628 5C

Physiological Changes in the Serum and Hepatopancreas of Yellow Tail Injected with Carbon Tetrachloride, (In Japanese),
W75-10630 5C

FISH POPULATIONS
Utilization of a Kraft Effluent Channel by Fish and Aquatic Organisms,
W75-10377 5C

FISHKILL
Toxicity of Chlorinated Municipal Wastes to Fish: An Evaluation Based on Michigan Field Data,
W75-10680 5C

FIXED-EFFECTIVENESS APPROACH
Nuclear Power Plant Cooling System Selection,
W75-10822 6C

FLAME PHOTOMETRY
Spectroscopic Determination of Atomization Efficiency (CuCl-Cu+Cl) in an Air-Hydrogen Flame,
W75-10498 2K

FLOATING
The Influence Surface Method for Floating Ice Plates,
W75-10504 2C

FLOATING ICE PLATES
The Influence Surface Method for Floating Ice Plates,
W75-10504 2C

FLOCCULATION
Use of Organic Flocculants for Textile Plant Water Treatment (Pouziti organickych flokulantu k cireni vody pro technologii textilni vyroby),
W75-10383 5F

FLOOD
Flood Plain Information: East Fork One Hundred and Two River, Bedford, Iowa.
W75-10566 4A

FLOOD CONTROL
Flood Plain Information: Macon County, Illinois.
W75-10565 4A

Flood Plain Information: East Fork One Hundred and Two River, Bedford, Iowa.
W75-10566 4A

Flood Plain Information: Brookings, Brookings County, South Dakota, Volume I - Deer Creek.
W75-10570 4A

Flood Plain Information: Catoma Creek, Vicinity of Montgomery, Alabama.
W75-10574 4A

Flood Plain Information: Falling Creek, Chesterfield County, Virginia.
W75-10577 4A

Flood Plain Information: James River, Eagle Rock to Lick Run, Botetourt County, Virginia.
W75-10578 4A

Flood Plain Information: Johnson Creek and Tributary, Chesterfield County, Virginia.
W75-10579 4A

Flood Hazards in the Seattle-Tacoma Urban Complex and Adjacent Areas, Washington,
W75-10580 7C

Waimano Stream Flood Control Project, Pearl City, Hawaii; Hydraulic Model Investigation,
W75-10663 8B

Flood Control Project on Lytle and Warm Creeks and Santa Ana River, California; Hydraulic Model Investigation,
W75-10668 8B

Environmental Issues, Effects, and Solutions,
W75-10795 6G

Optimal Sizing of Urban Flood-Control Systems,
W75-10821 4A

Derivation of Reservoir Operating Rules by Economic Analysis,
W75-10825 4A

FLOOD DAMAGE
Flood Plain Information: Bushkill Creek, Vicinity of Easton, Pennsylvania.
W75-10560 4A

Flood Plain Information: Brandywine Creek, Chester County, Pennsylvania.
W75-10562 4A

Flood Plain Information: White Clay Creek, New Castle County, Delaware.
W75-10571 4A

Flood Plain Information: Catoma Creek, Vicinity of Montgomery, Alabama.
W75-10574 4A

Flood Plain Information: Upper River Rouge, Minnow Pond Drain, Bell Branch and Tarabusi Creek, Wayne and Oakland Counties, Michigan.
W75-10575 4A

Flood Hazards in the Seattle-Tacoma Urban Complex and Adjacent Areas, Washington,
W75-10580 7C

FLOOD DATA
Flood Plain Information: Bloomsburg, Columbia County, Pennsylvania-Susquehanna River.
W75-10561 4A

Flood Plain Information: East Fork One Hundred and Two River, Bedford, Iowa.
W75-10566 4A

Flood Plain Information: Mill Run, Blair County, Pennsylvania.
W75-10568 4A

Flood Plain Information: West Branch Susquehanna River, Lycoming County, Pennsylvania.
W75-10576 4A

FLOOD DISCHARGE
Flood Waves and Suspended Sediment Pulses in Urbanized Catchments,
W75-10647 4C

FLOOD FLOW
Flood Plain Information: Goldsmith Gulch, Dutch Creek, Lilley Gulch, and Coon Creek, Volume VI, Denver Metropolitan Region, Colorado.
W75-10563 4A

Flood Control Project on Lytle and Warm Creeks and Santa Ana River, California; Hydraulic Model Investigation,
W75-10668 8B

FLOOD FORECASTING
Flood Plain Information: Ouachita River, Hot Springs Creek, Stokes Creek, Molly Creek, Gulpha Creek, City of Hot Springs, Arkansas.
W75-10559 4A

Flood Plain Information: Bushkill Creek, Vicinity of Easton, Pennsylvania.
W75-10560 4A

Flood Plain Information: Brandywine Creek, Chester County, Pennsylvania.
W75-10562 4A

Flood Plain Information: Goldsmith Gulch, Dutch Creek, Lilley Gulch, and Coon Creek, Volume VI, Denver Metropolitan Region, Colorado.
W75-10563 4A

Flood Plain Information: Macon County, Illinois.
W75-10565 4A

Special Flood Hazard Information Report: Chickasawhay River, Waynesboro, Wayne County, Mississippi.
W75-10569 4A

Flood Plain Information: Shabakunk Creek, West Branch Shabakunk and Little Shabakunk Creeks, Mercer County, New Jersey.
W75-10572 4A

Flood Plain Information: Upper River Rouge, Minnow Pond Drain, Bell Branch and Tarabusi Creek, Wayne and Oakland Counties, Michigan.
W75-10575 4A

Flood Plain Information: Johnson Creek and Tributary, Chesterfield County, Virginia.
W75-10579 4A

FLOOD FREQUENCY
Statistical Tolerance Limits for a Pearson Type III Distribution,
W75-10511 2E

Flood Plain Information: Macon County, Illinois.
W75-10565 4A

FLOOD HAZARDS
Flood Hazards in the Seattle-Tacoma Urban Complex and Adjacent Areas, Washington,
W75-10580 7C

FLOOD PEAK
Flood Plain Information: Goldsmith Gulch, Dutch Creek, Lilley Gulch, and Coon Creek, Volume VI, Denver Metropolitan Region, Colorado.
W75-10563 4A

A Comparison of Methods for Estimating Flood Peaks on Streams in Massachusetts,
W75-10587 4A

FLOOD PLAIN ZONING
Flood Plain Information Report: Seneca Creek, Montgomery County, Maryland.
W75-10567 4A

Flood Plain Information: Mill Run, Blair County, Pennsylvania.
W75-10568 4A

FLOOD PLAINS
Flood Plain Information: Ouachita River, Hot Springs Creek, Stokes Creek, Molly Creek, Gulpha Creek, City of Hot Springs, Arkansas.
W75-10559 4A

Flood Plain Information: Bushkill Creek, Vicinity of Easton, Pennsylvania.
W75-10560 4A

Flood Plain Information: Bloomsburg, Columbia County, Pennsylvania-Susquehanna River.
W75-10561 4A

Flood Plain Information: Brandywine Creek, Chester County, Pennsylvania.
W75-10562 4A

Flood Plain Information: Meadow Creek, Albemarle County and Charlottesville, Virginia.
W75-10564 4A

Flood Plain Information: Macon County, Illinois.
W75-10565 4A

Flood Plain Information: East Fork One Hundred and Two River, Bedford, Iowa.
W75-10566 4A

Special Flood Hazard Information Report: Chickasawhay River, Waynesboro, Wayne County, Mississippi.
W75-10569 4A

Flood Plain Information: Brookings, Brookings County, South Dakota, Volume I - Deer Creek.
W75-10570 4A

Flood Plain Information: White Clay Creek, New Castle County, Delaware.
W75-10571 4A

Flood Plain Information: Shabakunk Creek, West Branch Shabakunk and Little Shabakunk Creeks, Mercer County, New Jersey.
W75-10572 4A

Flood Plain Information: Catoma Creek, Vicinity of Montgomery, Alabama.
W75-10574 4A

Flood Plain Information: Upper River Rouge, Minnow Pond Drain, Bell Branch and Tarabusi Creek, Wayne and Oakland Counties, Michigan.
W75-10575 4A

Flood Plain Information: West Branch Susquehanna River, Lycoming County, Pennsylvania.
W75-10576 4A

Flood Plain Information: Falling Creek, Chesterfield County, Virginia.
W75-10577 4A

Flood Plain Information: James River, Eagle Rock to Lick Run, Botetourt County, Virginia.
W75-10578 4A

Flood Plain Information: Johnson Creek and Tributary, Chesterfield County, Virginia.
W75-10579 4A

Valley Design in Urban Growth Centres,
W75-10643 6B

FLOOD PROFILE

Flood Plain Information: Shabakunk Creek, West Branch Shabakunk and Little Shabakunk Creeks, Mercer County, New Jersey.
W75-10572 4A

FLOOD PROFILES

Flood Plain Information: Ouachita River, Hot Springs Creek, Stokes Creek, Molly Creek, Gulpha Creek, City of Hot Springs, Arkansas.
W75-10559 4A

Flood Plain Information: Bloomsburg, Columbia County, Pennsylvania-Susquehanna River.
W75-10561 4A

Flood Plain Information: Meadow Creek, Albemarle County and Charlottesville, Virginia.
W75-10564 4A

Flood Plain Information: Macon County, Illinois.
W75-10565 4A

Flood Plain Information: Mill Run, Blair County, Pennsylvania.
W75-10568 4A

Flood Plain Information: Catoma Creek, Vicinity of Montgomery, Alabama.
W75-10574 4A

Flood Plain Information: West Branch Susquehanna River, Lycoming County, Pennsylvania.
W75-10576 4A

Flood Plain Information: Falling Creek, Chesterfield County, Virginia.
W75-10577 4A

Flood Plain Information: James River, Eagle Rock to Lick Run, Botetourt County, Virginia.
W75-10578 4A

FLOOD PROTECTION

Flood Plain Information: Macon County, Illinois.
W75-10565 4A

Flood Plain Information Report: Seneca Creek, Montgomery County, Maryland.
W75-10567 4A

Valley Design in Urban Growth Centres,
W75-10643 6B

FLOOD RECURRENCE INTERVAL

Statistical Tolerance Limits for a Pearson Type III Distribution,
W75-10511 2E

The Effects of Urbanization on Floods of Different Recurrence Interval,
W75-10709 4C

FLOOD VELOCITY

Flood Plain Information: East Fork One Hundred and Two River, Bedford, Iowa.
W75-10566 4A

FLOODING

Phosphorus Availability of Some Philippine Rice Soils as Affected by Soil and Water Management Practices,
W75-10421 3F

Flood Plain Information: Ouachita River, Hot Springs Creek, Stokes Creek, Molly Creek, Gulpha Creek, City of Hot Springs, Arkansas.
W75-10559 4A

Flood Plain Information: Goldsmith Gulch, Dutch Creek, Lilley Gulch, and Coon Creek, Volume VI, Denver Metropolitan Region, Colorado.
W75-10563 4A

Flood Plain Information: Meadow Creek, Albemarle County and Charlottesville, Virginia.
W75-10564 4A

Flood Plain Information: Macon County, Illinois.
W75-10565 4A

Flood Plain Information: East Fork One Hundred and Two River, Bedford, Iowa.
W75-10566 4A

Flood Plain Information: Mill Run, Blair County, Pennsylvania.
W75-10568 4A

Special Flood Hazard Information Report: Chickasawhay River, Waynesboro, Wayne County, Mississippi.
W75-10569 4A

Flood Plain Information: Brookings, Brookings County, South Dakota, Volume I - Deer Creek.
W75-10570 4A

Flood Plain Information: Shabakunk Creek, West Branch Shabakunk and Little Shabakunk Creeks, Mercer County, New Jersey.
W75-10572 4A

Flood Plain Information: West Branch Susquehanna River, Lycoming County, Pennsylvania.
W75-10576 4A

Flood Plain Information: Falling Creek, Chesterfield County, Virginia.
W75-10577 4A

Flood Plain Information: James River, Eagle Rock to Lick Run, Botetourt County, Virginia.
W75-10578 4A

Flood Plain Information: Johnson Creek and Tributary, Chesterfield County, Virginia.
W75-10579 4A

Flooding and Soil Temperature Effects on Wheat During Grain Filling,
W75-10829 3F

FLOODPLAIN MANAGEMENT

Flood Plain Information Report: Seneca Creek, Montgomery County, Maryland.
W75-10567 4A

FLOODS

Flood Plain Information: Ouachita River, Hot Springs Creek, Stokes Creek, Molly Creek, Gulpha Creek, City of Hot Springs, Arkansas.
W75-10559 4A

Flood Plain Information: Bloomsburg, Columbia County, Pennsylvania-Susquehanna River.
W75-10561 4A

Flood Plain Information: Goldsmith Gulch, Dutch Creek, Lilley Gulch, and Coon Creek, Volume VI, Denver Metropolitan Region, Colorado.
W75-10563 4A

Flood Plain Information: Meadow Creek, Albemarle County and Charlottesville, Virginia.
W75-10564 4A

Flood Plain Information: Macon County, Illinois.
W75-10565 4A

Flood Plain Information Report: Seneca Creek, Montgomery County, Maryland.
W75-10567 4A

Special Flood Hazard Information Report: Chickasawhay River, Waynesboro, Wayne County, Mississippi.
W75-10569 4A

Flood Plain Information: Brookings, Brookings County, South Dakota, Volume I - Deer Creek.
W75-10570 4A

Flood Plain Information: West Branch Susquehanna River, Lycoming County, Pennsylvania.
W75-10576 4A

Flood Plain Information: Falling Creek, Chesterfield County, Virginia.
W75-10577 4A

Flood Plain Information: James River, Eagle Rock to Lick Run, Botetourt County, Virginia.
W75-10578 4A

Flood Plain Information: Johnson Creek and Tributary, Chesterfield County, Virginia.
W75-10579 4A

FLOODS

Flood Hazards in the Seattle-Tacoma Urban Complex and Adjacent Areas, Washington,
W75-10580 7C

A Comparison of Methods for Estimating Flood Peaks on Streams in Massachusetts,
W75-10587 4A

Hydrologic Data for Urban Studies in the Fort Worth, Texas Metropolitan Area, 1973,
W75-10596 7C

The Effects of Urbanization on Floods of Different Recurrence Interval,
W75-10709 4C

FLORIDA

Utilization of a Kraft Effluent Channel by Fish and Aquatic Organisms,
W75-10377 5C

The Loxahatchee - A River in Distress, Southeast Florida,
W75-10588 4C

Hydrological Data From Wells in Southwest Hillsborough County, Florida, 1950-74,
W75-10593 7C

Additional Studies of the Fishes, Macroinvertebrates and Hydrological Conditions of Upland Canals in Tampa Bay, Florida,
W75-10617 5C

Analysis of Pollution from Marine Engines - Status Report,
W75-10688 5A

Water and Wastewater Facilities for Florida Housing Developments,
W75-10717 5D

The Perimeter Canal - A New Approach to Discharge Urban Water into a Coastal Mangrove Area,
W75-10773 4A

New Concepts in Suburban Drainage in Florida,
W75-10793 4A

Effects of Farming - Urban Drainage on Fresh Water,
W75-10802 5G

FLOTATION

Increasing the Efficiency of Flotation Savealls (Povyshenie effektivnosti raboty flotatsionnykh lovushek),
W75-10369 5D

Serpaflo: Original Solution to Cleaning Paper Mill Effluents (Serpaflo; La solution originale d'epuration des eaux papeteries),
W75-10389 5D

FLOW

Devices for Toxicological Long-Term Studies on Aquatic Organisms (Gerate zur Durchfuhrung Toxikologischer Langzeitstudien an Wasserorganismen),
W75-10618 5A

FLOW SLOPE

Competence of Rivers to Transport Coarse Bedload Material,
W75-10540 2J

FLOW-THROUGH BIOASSAYS

Multichannel Toxicant Injection System for Flow-Through Bioassays,
W75-10443 5A

FLUCTUATIONS

On the Joint Distribution of the Periods and Amplitudes of Sea Waves,
W75-10534 2L

FLUID MECHANICS

Fluid-Dynamic Excitation Involving Flow Instability,
W75-10544 8B

Hydraulics and Mechanics of River Ice Jams,
W75-10556 8B

FLUOROMETRY

A Remote Sensing Laser Fluorometer,
W75-10831 5A

FLUVIAL SEDIMENTS

Competence of Rivers to Transport Coarse Bedload Material,
W75-10540 2J

FOOD CHAINS

Experimental Investigation on the Biological Concentration of Mercury-I. On the Rate of Mercury Transfer Through the Food Chain From Jack Mackerel to Young Yellowtail (In Japanese),
W75-10441 5C

Evaluation of Three Side Channels and the Main Channel Border of the Middle Mississippi River as Fish Habitat,
W75-10451 5C

Herbicides in Aquatic Systems,
W75-10625 5C

Acute Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitro-Phenol (TFM) to Nymphs of Mayflies (Hexagenia Sp.),
W75-10699 5C

FOOD PROCESSING INDUSTRY

Lagoons Plus Spray Irrigation for Effective Bean Cannery Waste Treatment,
W75-10678 5D

An Effluent Study of a Fresh Water Fish Processing Plant,
W75-10684 5D

Analysis of Wastewater Treatment Systems for a Meat Processing Plant,
W75-10687 5D

FOOD WEBS

Experimental Investigation on the Biological Concentration of Mercury-I. On the Rate of Mercury Transfer Through the Food Chain From Jack Mackerel to Young Yellowtail (In Japanese),
W75-10441 5C

Evaluation of Three Side Channels and the Main Channel Border of the Middle Mississippi River as Fish Habitat,
W75-10451 5C

FOREIGN COUNTRIES

Pedologic Cover of the Watershed of the Porecka River,
W75-10551 2A

FOREIGN TRADE

International Production Aspects of Water and Environmental Quality Control,
W75-10357 5G

FOREST FIRES

Watershed Behavior After Forest Fire in Washington,
W75-10790 4C

FOREST MANAGEMENT

Land Use Simulation Model of the Subalpine Coniferous Forest Zone,
W75-10404 3B

Watershed Management in the Rocky Mountain Subalpine Zone: The Status of Our Knowledge,
W75-10405 3B

Simulating Timber Yields and Hydrologic Impacts Resulting From Timber Harvest on Subalpine Watersheds,
W75-10406 3B

FORT WORTH (TEX)

Hydrologic Data for Urban Studies in the Fort Worth, Texas Metropolitan Area, 1973,
W75-10596 7C

FOSSIL FUELS

Toxic Trace Elements: Preferential Concentration in Respirable Particles,
W75-10482 5A

FRANKLIN AREA (VA)

A Predictive Computer Model of the Lower Cretaceous Aquifer, Franklin Area, Southeastern Virginia,
W75-10599 2F

FRASER RIVER (BRITISH COLUMBIA)

Nonlinear Channel Routing by Computer,
W75-10543 4A

FREEZING

Processes and Costs Imposed by Environmental Stress,
W75-10461 2C

Closed Recycling System for Water Purification and Waste Reduction,
W75-10735 5D

FREQUENCY

On the Joint Distribution of the Periods and Amplitudes of Sea Waves,
W75-10534 2L

FREQUENCY ANALYSIS

Comments on the Statistical Distribution of Rainfall per Period Under Various Transformations,
W75-10517 2B

FREQUENCY CURVES

Comments on the Statistical Distribution of Rainfall per Period Under Various Transformations,
W75-10517 2B

A Note on Mixed Distributions in Hydrology,
W75-10527 2E

A Two-Distribution Method for Fitting Mixed Distributions in Hydrology,
W75-10531 2E

FRESHWATER FISH

Water Quality Criteria for European Freshwater Fish.
W75-10610 5C

Studies on the Metabolism of Chlorophenols in Fish-III Isolation and Identification of a Conjugated PCP Excreted by Goldfish,
W75-10611 5A

Absorption, Metabolism, and Excretion by Goldfish of the Anionic Detergent Sodium Lauryl Sulphate,
W75-10626 5C

An Effluent Study of a Fresh Water Fish Processing Plant,
W75-10684 5D

FREUNDLICH EQUATION
Adsorption and Degradation of Chlorbromuron in Soil,
W75-10414 5B

FROGS
Listeria in Aquatic Animals,
W75-10375 2I

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) to Selected Aquatic Invertebrates and Frog Larvae,
W75-10703 5C

FROZEN GROUND
Geomorphic Processes in Polar Deserts,
W75-10456 2C

GALL BLADDER
Studies on the Metabolism of Chlorophenols in Fish-II Turnover in Absorbed PCP in Goldfish,
W75-10418 5C

GAMMA DISTRIBUTIONS
Comments on the Statistical Distribution of Rainfall per Period Under Various Transformations,
W75-10517 2B

GAS CHROMATOGRAPHY
Analysis of Tri-Aryl Phosphate Esters and the Determination of Imol S-140 in Fish Tissue and Water Samples by Gas Chromatography,
W75-10442 5A

GASES
Water Pollution Problems Associated with Control of Stack Gas Emission,
W75-10691 5B

Air and Water Pollution Control,
W75-10732 5D

GEOLOGIC INVESTIGATIONS
Hydrogeology of the Triassic Rocks of Maryland,
W75-10584 2F

GEOMORPHOLOGY
Glacier-Flow Patterns and the Origin of Late Wisconsinan Till in the Southern Rocky Mountain Trench, British Columbia,
W75-10539 2C

Competence of Rivers to Transport Coarse Bedload Material,
W75-10540 2J

GEORGIA
Heavy Metals Removal from Wood Preserving Wastewater,
W75-10675 5D

GEOTHERMAL STUDIES
Geomorphic Processes in Polar Deserts,
W75-10456 2C

Geothermal Channel and Harbor Ice Control System,
W75-10734 4A

Geothermal Power Plant with High Efficiency,
W75-10845 8C

GERMINATION
Effect of a Phytoplankton Culture on the Germination and Seedling Development of Barley, Sugar Beets and Lettuce,
W75-10496 3F

GILA PROJECT (ARIZ)
Change in Quality of Pumped Drainage Effluent,
W75-10779 5B

GLACIERS
Geological and Limnological Factors of Cold Deserts,
W75-10457 2C

Floating Glacial Ice Caps in the Arctic Ocean,
W75-10533 2C

Glacier-Flow Patterns and the Origin of Late Wisconsinan Till in the Southern Rocky Mountain Trench, British Columbia,
W75-10539 2C

GLACIOLOGY
Some Aspects of Climatology in Polar Barrens,
W75-10454 2C

GOLD
Rapid Extractive Spectrophotometric Determination of Gold (III) With 4-(2-Pyridylazo)-Resorcinol,
W75-10499 2K

GOLDEN IDE
Effect of a Mixture of Succinic Acid Mono-Sulpho-Ester and Olefin Sulfonate on Fish (Uber die Wirkung einer Mischung von Sulfobernsteinsaure-halbester und Olefinsulfonat auf Fische),
W75-10409 5C

GOLDFISH
Studies on the Metabolism of Chlorophenols in Fish-I Absorption and Excretion of PCP by Goldfish,
W75-10417 5C

Studies on the Metabolism of Chlorophenols in Fish-II Turnover in Absorbed PCP in Goldfish,
W75-10418 5C

Studies on the Metabolism of Chlorophenols in Fish-III Isolation and Identification of a Conjugated PCP Excreted by Goldfish,
W75-10611 5A

Absorption, Metabolism, and Excretion by Goldfish of the Anionic Detergent Sodium Lauryl Sulphate,
W75-10626 5C

GONADAL DEVELOPMENT
The Effect of Prolonged Exposure to Elevated Temperatures on the Biochemical Constituents, Gonadal Development and Shell Deposition of the American Oyster, Crassostrea Virginica,
W75-10849 5C

GOVERNMENT SUPPORTS
Indigenous Peoples of Polar Deserts,
W75-10460 6D

GRASSES
Effectiveness of Precipitation in a Mountain Meadow,
W75-10799 2D

GRAVITY-FLOW COLUMN
A Gravity-Flow Column to Provide Pesticide-Laden Water for Aquatic Bioassays,
W75-10844 5A

GREAT LAKES
International Field Year for the Great Lakes.
W75-10547 2H

International Field Year for the Great Lakes.
W75-10548 2H

International Field Year for the Great Lakes.
W75-10549 2H

International Field Year for the Great Lakes.
W75-10550 2H

GREAT PLAINS
Weather Modification for Use in the High Plains,
W75-10775 3B

Protein Content of Winter Wheat Grain as Related to Soil and Climatic Factors in the Semi-Arid Central Great Plains,
W75-10792 3F

GROUNDWATER
Hydraulic Behaviour of the Chalk Aquifer in the Yorkshire Wolds,
W75-10506 4B

Map of the Antelope Valley-East Kern Water Agency Area, California, Showing Ground-Water Subunits and Areas, Location of Wells, and Water-Level Contours for Spring 1974,
W75-10595 7C

Groundwater Model as a Tool in Planning and Management,
W75-10781 4B

Groundwater Protection in Highway Construction in the Catchment Area of the City of Berne at Kiesen (Grundwasserschutz beim Autobahn im Fassungsgebiet Stadt Bern in Kiesen),
W75-10837 5C

Water Analysis of River Waters in Kagawa (IX), Chemical Composition of the Aya Water Basin, (In Japanese),
W75-10841 2K

GROUNDWATER DEVELOPMENT
Ground-Water Conditions in Utah, Spring of 1975,
W75-10606 2F

GROUNDWATER RECHARGE
Seepage from Recharge and Landfill Ditches,
W75-10770 5B

GROUNDWATER RESOURCES
Evaluation of Ground Water Resources: Sacramento County,
W75-10546 2F

Ground-Water Levels in New Mexico, 1972,
W75-10582 4B

Hydrogeology of the Triassic Rocks of Maryland,
W75-10584 2F

Hydrologic Reconnaissance of the Southern Uinta Basin, Utah and Colorado,
W75-10585 3B

Hydrogeologic Data for the Farmington River Basin, Connecticut,
W75-10591 7C

Summary Appraisals of the Nation's Ground-Water Resources--Rio Grande Region,
W75-10597 4B

Summary Appraisals of the Nation's Ground-Water Resources--Ohio Region,
W75-10598 4B

Ground-Water Conditions in Utah, Spring of 1975,
W75-10606 2F

GROUNDWOOD PULP
Spent Liquor From Peroxide Bleaching of Groundwood Pulp From Spruce,
W75-10392 5A

GROWTH RATE
Bioassay Data for Marine Pollution Using Sea Urchin Eggs, 1972 and 1973,
W75-10432 5A

The Effects of a No. 2 Fuel Oil and Two Crude Oils on the Growth and Photosynthesis of Microalgae,
W75-10436 5C

GROWTH RATES
Toxaphene Effects on Growth and Development of Brook Trout (Salvelinus Fontinalis),
W75-10621 5C

Growth Factors in the Fish Meal Components of Catfish Diets,
W75-10658 2I

Toxicity of the Lampricide 3-Trifluoromethyl-4-nitrophenol (TFM) to 10 Species of Algae,
W75-10697 5C

GROWTH STAGES
Effects of Mirex on the Larval Development of Blue Crab,
W75-10410 5C

Acute Toxicity of Kanamycin to Steelhead Trout (Salmo Gairdneri),
W75-10423 5C

Effects of the Insecticide Sevin and Its First Hydrolytic Product, 1-Napthol, on Some Early Developmental Stages of the Bay Mussel, Mytilus edulis,
W75-10435 5C

Aspects of the Winter Ecology of Juvenile Coho Salmon (Oncorhynchus Kisutch) and Steelhead Trout (Salmo Gairdneri),
W75-10615 5C

Acute Toxicity of Ammonia to Several Developmental, Stages of Rainbow Trout, Salmo Gairdneri,
W75-10619 5C

Toxaphene Effects on Growth and Development of Brook Trout (Salvelinus Fontinalis),
W75-10621 5C

PCBS in the Spotted Sharks, Mustelus Manazo, From Tokyo Bay, (In Japanese),
W75-10622 5A

Effects of Temperature on Development and Survival of Rainbow Trout, Salmo Gairdneri, in Acid Waters,
W75-10623 5C

GUARD CELL MOTION
An Analysis of the Mechanics of Guard Cell Motion,
W75-10488 2I

GULF OF MEXICO
On the Joint Distribution of the Periods and Amplitudes of Sea Waves,
W75-10534 2L

GUNNISON (COL)
Effectiveness of Precipitation in a Mountain Meadow,
W75-10799 2D

HABITATS
Evaluation of Three Side Channels and the Main Channel Border of the Middle Mississippi River as Fish Habitat,
W75-10451 5C

HAIL SUPPRESSION
Weather Modification for Use in the High Plains,
W75-10775 3B

HALOGENATEED PESTICIDES
Toxaphene Effects on Growth and Development of Brook Trout (Salvelinus Fontinalis),
W75-10621 5C

HARBORS
Rivers in the City,
W75-10723 6B

HARDNESS (WATER)
Effect of Water Hardness on the Toxicity of a Nonionic Detergent to Fish,
W75-10444 5C

Effects of pH on Toxicity of Antimycin to Fish,
W75-10450 5C

Acute Toxicities of 3-Trifluoromethyl-4-Nitrophenol (TFM) and 2',5-Dichloro-4'-Nitrosalicylanilide (Bayer 73) to Larvae of the Midge (Chironomus Tentans),
W75-10698 5C

Acute Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitro-Phenol (TFM) to Nymphs of Mayflies (Hexagenia Sp.),
W75-10699 5C

Water Analysis of River Waters in Kagawa (IX), Chemical Composition of the Aya Water Basin, (In Japanese),
W75-10841 2K

HAWAII
Critical Thermal Maxima of Three Species of Hawaiian Estuarine Fish: A Comparative Study,
W75-10426 5C

Program for Control of Discharges of Pollutants to Navigable Waters.
W75-10608 5G

Waimano Stream Flood Control Project, Pearl City, Hawaii; Hydraulic Model Investigation,
W75-10663 8B

HAZARDS
Results of Airblast Overpressure Measurement Program at Project R.D. Bailey,
W75-10555 8H

HEAT TREATMENT
Heat Treatment of Sewage Sludges,
W75-10644 5D

HEATED WATER
The Effect of Prolonged Exposure to Elevated Temperatures on the Biochemical Constituents, Gonadal Development and Shell Deposition of the American Oyster, Crassostrea Virginica,
W75-10849 5C

HEAVY METALS
Effects of Heavy Metals and Pesticides on the Mass Mortalities of Cultured Shellfishes Along the Southwest Coast of Taiwan, (In Chinese),
W75-10427 5C

Heavy Metal Contents of Fishes Caught in Kaohsiung Harbor, (In Chinese),
W75-10430 5A

The Effect of Heavy Metals on Photosynthesis and Loss of Cell Potassium in Two Species of Marine Algae, Dunaliella tertiolecta and Phaeodactylum tricornutum,
W75-10447 5C

Thallium: Occurrence in the Environment and Toxicity to Fish,
W75-10449 5C

Absorption of Cadmium, Copper and Zinc by Dog Whelks in the Bristol Channel,
W75-10481 5B

Atomic-Absorption Spectrometric Determination of Copper, Lead, Cadmium and Manganese in Pulp and Paper by the Direct-Atomization Technique,
W75-10489 5A

Atomic Absorption Spectrometric Determination of Cadmium, Lead, Silver, Thallium and Zinc in Silicate Rocks by Direct Atomization From the Solid State,
W75-10492 2K

Uranium, Thorium, and Lead Concentrations in Three Silicate Standards and a Method of Lead Isotopic Analysis,
W75-10494 2K

Removal of Trace Metals During Conventional Water Treatment,
W75-10501 5F

On the Accumulation of Organochlorine Pesticides, PCB and Certain Heavy Metals in Fish and Shellfish from Thai Coastal and Inland Waters,
W75-10616 5B

The Concentration of Mercury, Copper, Nickel, Silver, Cadmium and Lead in the Northern Adriatic Anchovy, Engraulis Encrasicholus, and Sardine, Sardina Pilchardus,
W75-10620 5B

The Effect of Sublethal Concentrations of Copper and Zinc on Ventilatory Activity, Blood Oxygen, and pH in Rainbow Trout (Salmo Gairdneri),
W75-10624 5C

The Effect of Some Heavy Metal Ions on Photosynthesis in a Freshwater Alga,
W75-10627 5C

Trace Elements in Melbourne Rivers - An Interlaboratory Analysis,
W75-10649 5A

Heavy Metals Removal from Wood Preserving Wastewater,
W75-10675 5D

Process for Removing Heavy Metal Ions in Water,
W75-10731 5D

The Toxicity of Heavy Metal Ions to Anaerobic Digestion,
W75-10843 5D

HEPATOPANCREAS
Physiological Changes in the Serum and Hepatopancreas of Yellow Tail Injected with Carbon Tetrachloride, (In Japanese),
W75-10630 5C

HERBICIDES
Prediction of Trifluralin Diffusion Coefficients,
W75-10542 5B

Herbicides in Aquatic Systems,
W75-10625 5C

The Effect of Some Heavy Metal Ions on Photosynthesis in a Freshwater Alga,
W75-10627 5C

Predicting the Concentration of Aquatic Herbicide Residues in Waterways,
W75-10648 5B

HERRINGS
Combined Effects of Cadmium and Salinity on Development and Survival of Herring Eggs,
W75-10704 5C

HEXACHLOROBENZENE
Ocean Pollutants Pose Potential Danger to Man,
W75-10464 5B

HEXAGENIA SP.
Acute Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitro-Phenol (TFM) to Nymphs of Mayflies (Hexagenia Sp.),
W75-10699 5C

HIGH PLAINS
Weather Modification for Use in the High Plains,
W75-10775 3B

HIGH VELOCITY FLOW
Waimano Stream Flood Control Project, Pearl City, Hawaii; Hydraulic Model Investigation,
W75-10663 8B

HIGHWAY EFFECTS
Rivers in the City,
W75-10723 6B

Groundwater Protection in Highway Construction in the Catchment Area of the City of Berne at Kiesen (Grundwasserschutz beim Autobahn im Fassungsgebiet Stadt Bern in Kiesen),
W75-10837 5C

HIGHWAY ICING
New Snow Fence Design Controls Drifts, Improves Visibility, Reduces Road Ice,
W75-10693 2C

HILL REACTION
The Effect of Some Heavy Metal Ions on Photosynthesis in a Freshwater Alga,
W75-10627 5C

HISTORIC FLOODS
Flood Plain Information: Upper River Rouge, Minnow Pond Drain, Bell Branch and Tarabusi Creek, Wayne and Oakland Counties, Michigan.
W75-10575 4A

HISTORY
The Lower Colorado River: A Bibliography,
W75-10453 10C

HIWASSEE RIVER (TENN)
Fishes of the Hiwassee River System: Ecological and Taxonomic Considerations,
W75-10694 5C

HOURLY
Hourly Rainfall Generation for a Network,
W75-10515 2B

HUMAN PATHOLOGY
Redistribution and Concentration of Mercury in the Environment,
W75-10483 5B

HUMAN POPULATION
Lead Metabolism in the Normal Human: Stable Isotope Studies,
W75-10484 5A

HYDRAULIC CONDUCTIVITY
Measurement of Hydraulic Conductivity of Peats,
W75-10536 7B

HYDRAULIC DESIGN
Nonlinear Channel Routing by Computer,
W75-10543 4A

New Concepts in Suburban Drainage in Florida,
W75-10793 4A

HYDRAULIC MODELS
Physical Model Study of Circulation Patterns in Lake Ontario,
W75-10537 2H

Norton Point Dike Study, Coney Island, New York; Hydraulic Model Investigation,
W75-10662 8B

Waimano Stream Flood Control Project, Pearl City, Hawaii; Hydraulic Model Investigation,
W75-10663 8B

Navigation Conditions at Cannelton Locks and Dam, Ohio River; Hydraulic Model Investigation,
W75-10667 8B

Flood Control Project on Lytle and Warm Creeks and Santa Ana River, California; Hydraulic Model Investigation,
W75-10668 8B

Evaluation of Disposal Areas in James River; Hydraulic Model Investigation,
W75-10669 8B

Lake Erie International Jetport Model Feasibility Investigation, Physical Model Feasibility Study,
W75-10670 8B

Current Water Systems Automation Research and Development in the Bureau of Reclamation,
W75-10787 8C

HYDRAULIC STRUCTURES
Current Water Systems Automation Research and Development in the Bureau of Reclamation,
W75-10787 8C

HYDRAULIC STUCTURES
Some Factors Affecting Control of Flow in a Large Canal System,
W75-10786 8B

HYDRAULIC SYSTEMS
Water Works Improvements--Springfield, Vermont,
W75-10713 3D

HYDROGEN ION CONCENTRATION
Effects of pH on Toxicity of Antimycin to Fish,
W75-10450 5C

HYDROGEOLOGY
Evaluation of Ground Water Resources: Sacramento County,
W75-10546 2F

Hydrogeology of the Triassic Rocks of Maryland,
W75-10584 2F

A Predictive Computer Model of the Lower Cretaceous Aquifer, Franklin Area, Southeastern Virginia,
W75-10599 2F

HYDROGRAPHS
Effects of Surface Drainage on Stream Flow,
W75-10794 4A

HYDROLOGIC BUDGET
Evaluation of Ground Water Resources: Sacramento County,
W75-10546 2F

HYDROLOGIC DATA
Developing Regional Stochastic Data Bases,
W75-10528 2E

A Two-Distribution Method for Fitting Mixed Distributions in Hydrology,
W75-10531 2E

Hydrogeologic Data for the Farmington River Basin, Connecticut,
W75-10591 7C

Hydrological Data From Wells in Southwest Hillsborough County, Florida, 1950-74,
W75-10593 7C

Hydrologic Data for Urban Studies in the Fort Worth, Texas Metropolitan Area, 1973,
W75-10596 7C

Water Resources of the Toppenish Creek Basin, Yakima Indian Reservation, Washington.
W75-10603 3F

Low-Flow Characteristics of Mississippi Streams,
W75-10605 2E

HYDROLOGICAL SEQUENCES
Removal of Periodicities by Differencing and Monthyl Mean Subtraction,
W75-10352 2A

HYDROLOGY
Proceedings Symposium on Statistical Hydrology.
W75-10507 2A

Some Problems in Pure and Applied Stochastic Hydrology,
W75-10508 2A

General Aspects of Multivariate Analysis with Applications to Some Problems in Hydrology,
W75-10510 2A

A Note on Mixed Distributions in Hydrology,
W75-10527 2E

A Two-Distribution Method for Fitting Mixed Distributions in Hydrology,
W75-10531 2E

Progress in Australian Hydrology 1965-1974.
W75-10646 2A

HYDROXIDES
Gravity Dewatering of Metal Hydroxide Sludges,
W75-10500 5D

HYPOCHLOROUS ACID
Water Quality Criteria for European Freshwater Fish.
W75-10609 5C

ICE
Processes and Costs Imposed by Environmental Stress,
W75-10461 2C

Large Scale Laboratory Direct Shear Tests on Ice,
W75-10502 2C

The Influence Surface Method for Floating Ice Plates,
W75-10504 2C

Icings Along the Trans-Alaska Pipeline Route,
W75-10592 2C

ICE COVER
Geological and Limnological Factors of Cold Deserts,
W75-10457 2C

Geothermal Channel and Harbor Ice Control System,
W75-10734 4A

ICE FOG
Processes and Costs Imposed by Environmental Stress,
W75-10461 2C

ICE JAMS
Hydraulics and Mechanics of River Ice Jams,
W75-10556 8B

ICE THICKNESS
Floating Glacial Ice Caps in the Arctic Ocean,
W75-10533 2C

ILLINOIS
Flood Plain Information: Macon County, Illinois.
W75-10565 4A

Turbulent Flow in Rectangular Outlet Conduit, Rend Lake Dam, Big Muddy River, Illinois,
W75-10666 8B

IMMATURE GROWTH STAGE
Combined Effects of Cadmium and Salinity on Development and Survival of Herring Eggs,
W75-10704 5C

IMOL
Analysis of Tri-Aryl Phosphate Esters and the Determination of Imol S-140 in Fish Tissue and Water Samples by Gas Chromatography,
W75-10442 5A

IMPERIAL VALLEY (CAL)
Effect of Agricultural Use on Water Quality for Downstream Use for Irrigation,
W75-10805 5G

INCOME ANALYSIS
Review of the Economic Benefits and Costs Resulting from Dewey Reservoir,
W75-10828 6B

INCOME DISTRIBUTION
Review of the Economic Benefits and Costs Resulting from Dewey Reservoir,
W75-10828 6B

INDIAN RESERVATIONS
Water Resources of the Toppenish Creek Basin, Yakima Indian Reservation, Washington.
W75-10603 3F

INDIANA
A River-Quality Assessment of the Upper White River, Indiana,
W75-10600 5B

Navigation Conditions at Cannelton Locks and Dam, Ohio River; Hydraulic Model Investigation,
W75-10667 8B

Disposal of Liquid Effluent by Land Irrigation at Lagro Celotex Plant,
W75-10679 5D

INDUSTRIAL INTERDEPENDENCIES
Theoretical and Applied Concepts of Water Resources for Social Welfare.
W75-10354 6B

Industrial Interdependencies and External Diseconomies of Water Resources,
W75-10358 6B

INDUSTRIAL PRODUCTION
Industrial Interdependencies and External Diseconomies of Water Resources,
W75-10358 6B

INDUSTRIAL WASTES
Serpaflo: Original Solution to Cleaning Paper Mill Effluents (Serpaflo; La solution originale d'epuration des eaux papeteries),
W75-10389 5D

Toxic Effects of Aliphatic Chlorinated by-Products from Vinyl Chloride Production on Marine Animals,
W75-10412 5C

Toxic Trace Elements: Preferential Concentration in Respirable Particles,
W75-10482 5A

Guidelines for Landfill of Toxic Industrial Sludges,
W75-10487 5G

The Mutual Destruction of Polluting Factors in Waste Liquors,
W75-10645 5D

Heavy Metals Removal from Wood Preserving Wastewater,
W75-10675 5D

Reclamation of Textile Printing Wastewaters for Direct Recycle,
W75-10676 5D

Disposal of Liquid Effluent by Land Irrigation at Lagro Celotex Plant,
W75-10679 5D

Treatment of Winery Wastes by Aerated Lagoon, Activated Sludge, and Rotating Biological Contractor,
W75-10685 5D

Automated Sequential Composite Sampling. A New Technique for Water Pollution Study and Control,
W75-10690 5A

Method of Treating Aluminum-Containing Waste Water,
W75-10730 5D

Process for Removing Heavy Metal Ions in Water,
W75-10731 5D

Air and Water Pollution Control,
W75-10732 5D

Proceedings of the International Conference on Waste Oil Recovery and Reuse.
W75-10739 5D

The Consequences of Accepting Industrial Wastes into Sewers; Water Pollution Research at Stevenage,
W75-10842 5D

An Evaluation of Persistency for Water Borne Organics,
W75-10850 5B

INDUSTRIAL WATER
Industrial Interdependencies and External Diseconomies of Water Resources,
W75-10358 6B

Water for Industrial Development in Alcorn, Itawamba, Prentiss, and Tishomingo Counties, Mississippi,
W75-10581 3E

Economic Impact of the Conversion of Water from Irrigation to Municipal and Industrial Use in the Rio Grande Basin of New Mexico,
W75-10771 6D

INFORMATION SYSTEMS
Necessary Adaptations for Significant Utilization of the Information System,
W75-10816 6A

INFRARED RADIOMETER
Laboratory Measurement of Surface Temperature Fluctuations Induced by Small Amplitude Surface Waves,
W75-10505 2L

INHIBITION
Bioassay Data for Marine Pollution Using Sea Urchin Eggs, 1972 and 1973,
W75-10432 5A

INLAND WATERWAYS
The Perimeter Canal - A New Approach to Discharge Urban Water into a Coastal Mangrove Area,
W75-10773 4A

INSECT CONTROL
Biological Activity of Organophosphorus Compounds and Synthetic Pyrethroids Against Immature Mosquitoes,
W75-10631 5G

INSECTICIDES
Effect of the Insecticide Zectran (Mexacarbate) on Several Algae,
W75-10425 5C

Toxicity of Two Synthetic Pyrethrins to Brown Trout,
W75-10438 5C

Toxicity of Paired Mixtures of Candidate Forest Insecticides to Rainbow Trout,
W75-10439 5C

INTEREST RATES
Financing Water Works,
W75-10712 3D

INTERNATIONAL FIELD YEAR FOR THE GREAT LAKES
International Field Year for the Great Lakes.
W75-10547 2H

International Field Year for the Great Lakes.
W75-10548 2H

International Field Year for the Great Lakes.
W75-10549 2H

International Field Year for the Great Lakes.
W75-10550 2H

INTERNATIONAL HYDROLOGICAL DECADE
International Field Year for the Great Lakes.
W75-10547 2H

International Field Year for the Great Lakes.
W75-10548 2H

International Field Year for the Great Lakes.
W75-10549 2H

International Field Year for the Great Lakes.
W75-10550 2H

INTERNATIONAL WATERS
International Field Year for the Great Lakes.
W75-10547 2H

International Field Year for the Great Lakes.
W75-10548 2H

International Field Year for the Great Lakes.
W75-10549 2H

International Field Year for the Great Lakes.
W75-10550 2H

INVERTEBRATES
Water Quality Criteria for European Fresh-Water Fish.
W75-10609 5C

Toxicity and Residue Dynamics of the Lampricide 3-Trifluoro-Methyl-4-Nitrophenol (TFM) in Aquatic Invertebrates,
W75-10700 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) to Selected Aquatic Invertebrates and Frog Larvae,
W75-10703 5C

ION EXCHANGE
Color Removal From Bleached Kraft Effluents,
W75-10399 5D

Concentration of Dilute Waste Streams by Ion Exchange Techniques,
W75-10672 5D

ION EXCHANGE RESINS
Problems of Space Biology. Volume 24. The Water Supply of Spacecraft Crews,
W75-10365 5D

IONS
The Effect of Some Heavy Metal Ions on Photosynthesis in a Freshwater Alga,
W75-10627 5C

IOWA
Flood Plain Information: East Fork One Hundred and Two River, Bedford, Iowa.
W75-10566 4A

Five Year Study of Des Moines River Water Quality,
W75-10803 5B

IRON
X-ray Microanalysis of Zinc and Iron in the Cheloride Cells of Mayfly Larvae of the River Sulz, (Rontgenmikroanalyse von Zink und Eisen in Chloridzellen von Eintagsfligenlarven aus der Sulz),
W75-10416 5A

Some Observations on Spawning of Brook Trout (Salvelinus Fontinalis Mitchill) in Lime Neutralized Iron Hydroxide Suspensions,
W75-10445 5C

IRON OXIDES
Some Observations on Spawning of Brook Trout (Salvelinus Fontinalis Mitchill) in Lime Neutralized Iron Hydroxide Suspensions,
W75-10445 5C

IRRIGATION
Waste Water Treatment: Land Disposal of Waste Water,
W75-10373 5E

Agricultural and Urban Considerations in Irrigation and Drainage.
W75-10769 4A

Groundwater Control by Pumping,
W75-10778 4B

Change in Quality of Pumped Drainage Effluent,
W75-10779 5B

Wellton-Mohawk Drainage and the Mexican Salt Problem,
W75-10783 4A

Water Use and Production of Trickle Irrigated Onions,
W75-10785 3F

Float Valve Provides Variable Flow Rates at Low Pressures,
W75-10789 8C

Utilization of Sewage Effluent for Irrigation,
W75-10798 5D

Effectiveness of Precipitation in a Mountain Meadow,
W75-10799 2D

Irrigation Management for Salt Control,
W75-10800 3C

Trickle Irrigation Design Requirements for Row Crops,
W75-10801 3F

Effect of Agricultural Use on Water Quality for Downstream Use for Irrigation,
W75-10805 5G

IRRIGATION CANALS
Predicting the Concentration of Aquatic Herbicide Residues in Waterways,
W75-10648 5B

IRRIGATION EFFICIENCY
Water Use and Production of Trickle Irrigated Onions,
W75-10785 3F

Trickle Irrigation Design Requirements for Row Crops,
W75-10801 3F

IRRIGATION ENGINEERING
Development of Large Scale Drip Irrigation Systems,
W75-10784 3F

Float Valve Provides Variable Flow Rates at Low Pressures,
W75-10789 8C

IRRIGATION PRACTICES
Water Use and Production of Trickle Irrigated Onions,
W75-10785 3F

IRRIGATION SYSTEMS
Disposal of Liquid Effluent by Land Irrigation at Lagro Celotex Plant,
W75-10679 5D

Development of Large Scale Drip Irrigation Systems,
W75-10784 3F

Automation of an Existing Irrigation System - Part I,
W75-10788 8C

Float Valve Provides Variable Flow Rates at Low Pressures,
W75-10789 8C

Trickle Irrigation Design Requirements for Row Crops,
W75-10801 3F

IRRIGATION WATER
Economic Impact of the Conversion of Water from Irrigation to Municipal and Industrial Use in the Rio Grande Basin of New Mexico,
W75-10771 6D

ISRAEL
Effects of Soil Moisture on Stress on 2 Varieties of Upland Cotton in Israel: IV. Effects of Periods of Stress Occurrence, Correlations and Regressions,
W75-10791 3F

JACK MACKEREL
Experimental Investigation on the Biological Concentration of Mercury-I. On the Rate of Mercury Transfer Through the Food Chain From Jack Mackerel to Young Yellowtail (In Japanese),
W75-10441 5C

JAMES RIVER (VA)
Flood Plain Information: James River, Eagle Rock to Lick Run, Botetourt County, Virginia.
W75-10578 4A

Evaluation of Disposal Areas in James River; Hydraulic Model Investigation,
W75-10669 8B

JAPAN
Taio Paper (Company, Iyomishima, Japan) Expands to 1,000,000 Tons/Year,
W75-10380 5D

PCBS in the Spotted Sharks, Mustelus Manazo, From Tokyo Bay, (In Japanese),
W75-10622 5A

Treatment of Service Water with Ozone,
W75-10840 5D

JOHNSON CREEK (VA)
Flood Plain Information: Johnson Creek and Tributary, Chesterfield County, Virginia.
W75-10579 4A

JUVENILE GROWTH STAGE
Aspects of the Winter Ecology of Juvenile Coho Salmon (Oncorhynchus Kisutch) and Steelhead Trout (Salmo Gairdneri),
W75-10615 5C

KANAMYCIN
Acute Toxicity of Kanamycin to Steelhead Trout (Salmo Gairdneri),
W75-10423 5C

KANSAS
Users' View of Weather Modification,
W75-10776 3B

KAOHSIUNG HARBOR (TAIWAN)
Heavy Metal Contents of Fishes Caught in Kaohsiung Harbor, (In Chinese),
W75-10430 5A

KENTUCKY
Derivation of Reservoir Operating Rules by Economic Analysis,
W75-10825 4A

Analysis of Reservoir Recreation Benefits,
W75-10826 6B

The Effect of Landowner Attitude on the Financial and the Economic Costs of Acquiring Land for a Large Public Works Project,
W75-10827 6B

Review of the Economic Benefits and Costs Resulting from Dewey Reservoir,
W75-10828 6B

KEPONE (TRADE NAME)
Inhibition of ATPases Acitivity in Channel Catfish Brain by Kepone(Trade Name) and its Reduction Product,
W75-10612 5C

KILLIFISHES
Residue Analyses on 2-Amino-4 Phenylthiazole, a Piscine Anesthetic, in Fishes-I a Model Radio-Tracer Experiment with Medaka,
W75-10614 5A

KUHLIA SANDVICENSIS
Critical Thermal Maxima of Three Species of Hawaiian Estuarine Fish: A Comparative Study,
W75-10426 5C

LABORATORY TESTS
Laboratory Measurement of Surface Temperature Fluctuations Induced by Small Amplitude Surface Waves,
W75-10505 2L

Devices for Toxicological Long-Term Studies on Aquatic Organisms (Gerate zur Durchfuhrung Toxikologischer Langzeitstudien an Wasserorganismen),
W75-10618 5A

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) To Nontarget Fish in Flow- Through Tests,
W75-10702 5C

A Gravity-Flow Column to Provide Pesticide-Laden Water for Aquatic Bioassays,
W75-10844 5A

The Effect of the Quantity of Silt to the Attached Microorganisms of the Kuzuryu-Gawa River in the Hokuriku District, (In Japanese),
W75010696 5C

LAKE APOPKA (FLA)
Effects of Farming - Urban Drainage on Fresh Water,
W75-10802 5G

LAKE ERIE
Lake Erie International Jetport Model Feasibility Investigation, Physical Model Feasibility Study,
W75-10670 8B

LAKE ICE
Large Scale Laboratory Direct Shear Tests on Ice,
W75-10502 2C

LAKE KINNERET (SEA OF GALILEE)
Urea in the Waters of Lake Kinneret (Sea of Galilee),
W75-10420 5C

LAKE ONTARIO
Physical Model Study of Circulation Patterns in Lake Ontario,
W75-10537 2H

International Field Year for the Great Lakes.
W75-10549 2H

LAKES
Indigenous Peoples of Polar Deserts,
W75-10460 6D

Suppression of Nitrogen Fixation by Blue-Green Alage in a Eutrophic Lake with Trace Additions of Copper,
W75-10480 5C

Lake Erie International Jetport Model Feasibility Investigation, Physical Model Feasibility Study,
W75-10670 8B

LAMPRICIDES
Uptake, Elimination and Biotransformation of the Lampricide 3-Trifluromethyl-4-Nitrophenol (TFM) by Larvae of the Aquatic Midge Chironomus Tentans,
W75-10629 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-nitrophenol (TFM) to 10 Species of Algae,
W75-10697 5C

Acute Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitro-Phenol (TFM) to Nymphs of Mayflies (Hexagenia Sp.),
W75-10699 5C

Toxicity and Residue Dynamics of the Lampricide 3-Trifluoro-Methyl-4-Nitrophenol (TFM) in Aquatic Invertebrates,
W75-10700 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) to the Nontarget Fish in Static Tests,
W75-10701 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) To Nontarget Fish in Flow- Through Tests,
W75-10702 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) to Selected Aquatic Invertebrates and Frog Larvae,
W75-10703 5C

LAND CLEARING
Hydrology of the Albemarle-Pamlico Region, North Carolina--A Preliminary Report on the Impact of Agricultural Developments,
W75-10602 4C

LAND IRRIGATION
Disposal of Liquid Effluent by Land Irrigation at Lagro Celotex Plant,
W75-10679 5D

LAND USE
Land Use Simulation Model of the Subalpine Coniferous Forest Zone,
W75-10404 3B

Flood Plain Information: White Clay Creek, New Castle County, Delaware.
W75-10571 4A

Rivers in the City,
W75-10723 6B

LANDFILLS
Guidelines for Landfill of Toxic Industrial Sludges,
W75-10487 5G

Disposal of Digested Sewage Sludge by Landfill,
W75-10682 5D

Treatability of Leachate from Sanitary Landfills,
W75-10683 5D

Seepage from Recharge and Landfill Ditches,
W75-10770 5B

LANDSLIDES
A Numerical Model for Predicting the Effects of Landslide-Generated Water Waves,
W75-10661 8A

LARVAE
Effects of Mirex on the Larval Development of Blue Crab,
W75-10410 5C

X-ray Microanalysis of Zinc and Iron in the Cheloride Cells of Mayfly Larvae of the River Sulz, (Rontgenmikroanalyse von Zink und Eisen in Chloridzellen von Eintagsfligenlarven aus der Sulz),
W75-10416 5A

LARVAL GROWTH STAGE
Effects of the Insecticide Sevin and Its First Hydrolytic Product, 1-Napthol, on Some Early Developmental Stages of the Bay Mussel, Mytilus edulis,
W75-10435 5C

LARVICIDES
Biological Activity of Organophosphorus Compounds and Synthetic Pyrethroids Against Immature Mosquitoes,
W75-10631 5G

LASERS
A Remote Sensing Laser Fluorometer,
W75-10831 5A

LC50
Temperature-Induced Changes in Acute Toxicity of Zinc to Atlantic Salmon (Salmo salar),
W75-10431 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) to Selected Aquatic Invertebrates and Frog Larvae,
W75-10703 5C

LEACHATE
Treatability of Leachate from Sanitary Landfills,
W75-10683 5D

LEACHATE TREATMENT
Treatability of Leachate from Sanitary Landfills,
W75-10683 5D

LEACHING
Irrigation Management for Salt Control,
W75-10800 3C

LEAD
Determination of Cadmium, Copper, and Lead in Natural Waters After Anion-Exchange Separation,
W75-10385 5A

Heavy Metal Contents of Fishes Caught in Kaohsiung Harbor, (In Chinese),
W75-10430 5A

Electron Microscope Autoradiography of Kidney After Administration of PB-210 in Mice,
W75-10476 5A

Lead Metabolism in the Normal Human: Stable Isotope Studies,
W75-10484 5A

Uranium, Thorium, and Lead Concentrations in Three Silicate Standards and a Method of Lead Isotopic Analysis,
W75-10494 2K

The Concentration of Mercury, Copper, Nickel, Silver, Cadmium and Lead in the Northern Adriatic Anchovy, Engraulis Encrasicholus, and Sardine, Sardina Pilchardus,
W75-10620 5B

LEAD POLLUTION
Health Implications of Exposure to Trace Metals from Combustion of Waste Oil,
W75-10765 5C

LEGISLATION
New Legislative Tendencies for Control of Water Pollution (Nuevas tendencias legislativas en el control de la contaminacion de las aguas),
W75-10384 5G

Safe Drinking Water Has Become a Federal Case.
W75-10469 5G

EPA's Effluent Guidelines Have Their Day in Court.
W75-10470 5G

Massachusetts Waste Oil Management Activities,
W75-10763 5D

The Consequences of Accepting Industrial Wastes into Sewers; Water Pollution Research at Stevenage,
W75-10842 5D

LEMON
Responses of 'Bearss' Lemon to Nitrogen, Potassium and Irrigation Applications,
W75-10714 3F

LETHAL LIMIT
Effects of Mirex on the Larval Development of Blue Crab,
W75-10410 5C

Toxic Effects of Aliphatic Chlorinated by-Products from Vinyl Chloride Production on Marine Animals,
W75-10412 5C

Toxicity of Phosphamidon to American Lobsters (Homarus Americanus) Held at 4 and 12C,
W75-10413 5C

Studies on the Metabolism of Chlorophenols in Fish-I Absorption and Excretion of PCP by Goldfish,
W75-10417 5C

Temperature-Induced Changes in Acute Toxicity of Zinc to Atlantic Salmon (Salmo salar),
W75-10431 5C

Toxicity of Two Synthetic Pyrethrins to Brown Trout,
W75-10438 5C

Acute Toxicity of Ammonia to Several Developmental, Stages of Rainbow Trout, Salmo Gairdneri,
W75-10619 5C

The Effect of Sublethal Concentrations of Copper and Zinc on Ventilatory Activity, Blood Oxygen, and pH in Rainbow Trout (Salmo Gairdneri),
W75-10624 5C

Biological Bases for Water Quality Standards,
W75-10677 5G

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) to the Nontarget Fish in Static Tests,
W75-10701 5C

LETTUCE
Effect of a Phytoplankton Culture on the Germination and Seedling Development of Barley, Sugar Beets and Lettuce,
W75-10496 3F

LEUCISCUS IDUS MELANOTUS
Effect of a Mixture of Succinic Acid Mono-Sulpho-Ester and Olefin Sulfonate on Fish (Uber die Wirkung einer Mischung von Sulfobernsteinsaure-halbester und Olefinsulfonat auf Fische),
W75-10409 5C

LIME
Some Observations on Spawning of Brook Trout (Salvelinus Fontinalis Mitchill) in Lime Neutralized Iron Hydroxide Suspensions,
W75-10445 5C

LIMITING NUTRIENTS
Environmental Limitations on the Microbial Degradation of Hydrocarbons in Temperate Lakes,
W75-10407 5C

LIMNOLOGY
Geological and Limnological Factors of Cold Deserts,
W75-10457 2C

LIPIDS
Effect of Dietary Selenium on Glutathione Peroxidase in the Chick,
W75-10495 5A

PCBS in the Spotted Sharks, Mustelus Manazo, From Tokyo Bay, (In Japanese),
W75-10622 5A

LIQUIFIED NATURAL GAS (LNG)
Jettisoning of LNG at Sea--An Unresolved Pollution Hazard.
W75-10633 5G

LISTERIA-MONOCYTOGENES
Listeria in Aquatic Animals,
W75-10375 2I

LOADS (FORCES)
The Influence Surface Method for Floating Ice Plates,
W75-10504 2C

LOBSTERS
Toxicity of Phosphamidon to American Lobsters (Homarus Americanus) Held at 4 and 12C,
W75-10413 5C

LOCAL PRECIPITATION
Environmental Problems Associated with the Use of Cooling Towers,
W75-10671 5D

LOCKS
Navigation Conditions at Cannelton Locks and Dam, Ohio River; Hydraulic Model Investigation,
W75-10667 8B

LODGEPOLE PINE TREES
Canopy Weight Distribution Affects Windspeed and Temperature in a Lodgepole Pine Forest,
W75-10654 4A

LOGGING (RECORDING)
Instruction for Record Keeping of Water Consumption at the Enterprises of the Paper Industry (Instruktsiya ucheta raskhoda vody na predpriyatiyakh otrasli),
W75-10370 3E

LONG BEACH HARBOR (CAL)
Los Angeles and Long Beach Harbors Model Study; Report 2, Observations of Ship Mooring and Movement,
W75-10664 8B

LOPEZ RESERVOIR (CALIF)
Problems Related to Water Quality and Algal Control in Lopez Reservoir, San Luis Obispo County, California,
W75-10601 5B

LOS ANGELES HARBOR (CAL)
Los Angeles and Long Beach Harbors Model Study; Report 2, Observations of Ship Mooring and Movement,
W75-10664 8B

LOUISIANA
Index to Water Resources Data for Louisiana: Surface Water Records; Water-Quality Records.
W75-10590 5A

LOW FLOW
Recurrence Intervals of Annual Minimum Streamflows,
W75-10530 2E

Low-Flow Characteristics of Mississippi Streams,
W75-10605 2E

LOW FLOW FREQUENCY
Low-Flow Characteristics of Mississippi Streams,
W75-10605 2E

LOXAHATCHEE RIVER (FLA)
The Loxahatchee - A River in Distress, Southeast Florida,
W75-10588 4C

LUBBOCK (TEX)
Statistical Model of Short-Duration Precipitation Events,
W75-10529 2B

LUBE OIL
Re-Refined Diesel Locomotive Lubricating Oil,
W75-10761 5D

LUBE OILS
The Source and Supply of Virgin Lubes,
W75-10741 5B

LUBRICANTS
Experience with the IFP Propane Clarification Process in Re-Refining Spent Crankcase Oils,
W75-10759 5D

LUMBERING
Land Use Simulation Model of the Subalpine Coniferous Forest Zone,
W75-10404 3B

LYSIMETERS
Phosphorus in Percolates from Manured Lysimeters,
W75-10573 5B

MAGDEBURG COUNTY (EAST GERMANY)
Principles of Establishing Sewer Systems in the Rural Settlements of Magdeburg County (Grundlagen fuer die Abwasser-Technische Erschliessung von Landgemeinden im Bezirk Magdeburg),
W75-10833 5D

MAINTENANCE COSTS
Process Design Manual for Sludge Treatment and Disposal.
W75-10475 5D

MALLARD DUCK
Effects of Methylmercury on Approach and Avoidance Behavior of Mallard Ducklings,
W75-10424 5C

MANAGEMENT
Study of Solid Waste Management Practices in the Pulp and Paper Industry.
W75-10366 5D

Groundwater Model as a Tool in Planning and Management,
W75-10781 4B

MANGANESE
Determination of Manganese in Natural Waters by Atomic Absortion Spectrometry with a Carbon Tube Atomizer,
W75-10386 5A

The Effect of Different Salinities and Manganese Ion on the Survival Respiration of the Baltic Flounder (Pleuronectes Flesus Trachurus (Dunker)) of the Gulf of Riga,
W75-10411 5C

MAPS
Map of the Antelope Valley-East Kern Water Agency Area, California, Showing Ground-Water Subunits and Areas, Location of Wells, and Water-Level Contours for Spring 1974,
W75-10595 7C

MARINE ALGAE
The Effect of Heavy Metals on Photosynthesis and Loss of Cell Potassium in Two Species of Marine Algae, Dunaliella tertiolecta and Phaeodactylum tricornutum,
W75-10447 5C

MARINE FISH
Experimental Investigation on the Biological Concentration of Mercury-I. On the Rate of Mercury Transfer Through the Food Chain From Jack Mackerel to Young Yellowtail (In Japanese),
W75-10441 5C

MARKING TECHNIQUES
Influence of a Thermal Effluent on Movement of Brown Bullhead (Ictalurus Nebulosus) as Determined by Ultrasonic Tracking,
W75-10628 5C

MARKOV CHAIN MODEL
A Stochastic Model for Daily Rainfall Data Synthesis,
W75-10518 2B

Stochastic Model of Daily Rainfall,
W75-10520 2B

MARKOV PROCESSES
Statistical Inference on Streamflow Processes with Markovian Characteristics,
W75-10525 2E

MARYLAND
Daily Temperature and Salinity of Surface Water of Patuxent River at Solomons, Maryland, Based on 30 Years of Records (1938-1967),
W75-10535 2E

Flood Plain Information Report: Seneca Creek, Montgomery County, Maryland.
W75-10567 4A

Hydrogeology of the Triassic Rocks of Maryland,
W75-10584 2F

Waste Oil--Solution to Maryland's Energy Crisis,
W75-10762 5D

An Economic Model of Waste Oil Recovery, Reprocessing and Distribution Systems,
W75-10768 5D

MASS TRANSFER
A Theory of the Mass Transport of Previously Distributed Chemicals in a Water-Saturated Sorbing Porous Medium: 4. Distributions,
W75-10632 5B

MASSACHUSETTS
A Comparison of Methods for Estimating Flood Peaks on Streams in Massachusetts,
W75-10587 4A

Water Supply from Renovated Wastewater--A Resource Manual for Massachusetts Planners, Public Officials and Citizen Groups.
W75-10722 5D

Massachusetts Waste Oil Management Activities,
W75-10763 5D

MATERIALS TESTING
NBS Adds Foreign Wrinkle to Standards Work,
W75-10490 5A

MATHEMATICAL MODELS
Political Participation and Water Rates. A Closer Look,
W75-10361 6C

A Note on Mixed Distributions in Hydrology,
W75-10527 2E

Developing Regional Stochastic Data Bases,
W75-10528 2E

Statistical Model of Short-Duration Precipitation Events,
W75-10529 2B

Recurrence Intervals of Annual Minimum Streamflows,
W75-10530 2E

A Two-Distribution Method for Fitting Mixed Distributions in Hydrology,
W75-10531 2E

Hydraulics and Mechanics of River Ice Jams,
W75-10556 8B

A Numerical Model for Predicting the Effects of Landslide-Generated Water Waves,
W75-10661 8A

Los Angeles and Long Beach Harbors Model Study; Report 2, Observations of Ship Mooring and Movement,
W75-10664 8B

An Economic Model of Waste Oil Recovery, Reprocessing and Distribution Systems,
W75-10768 5D

Current Water Systems Automation Research and Development in the Bureau of Reclamation,
W75-10787 8C

ACTMO, An Agricultural Chemical Transport Model,
W75-10846 5B

MAYFLIES
X-ray Microanalysis of Zinc and Iron in the Cheloride Cells of Mayfly Larvae of the River Sulz, (Rontgenmikroanalyse von Zink und Eisen in Chloridzellen von Eintagsfligenlarven aus der Sulz),
W75-10416 5A

The Drift of Mayflies (Ephemeroptera) in the Brazos River, Texas,
W75-10558 5B

Acute Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitro-Phenol (TFM) to Nymphs of Mayflies (Hexagenia Sp.),
W75-10699 5C

Toxicity and Residue Dynamics of the Lampricide 3-Trifluoro-Methyl-4-Nitrophenol (TFM) in Aquatic Invertebrates,
W75-10700 5C

MEADOW CREEK (VA)
Flood Plain Information: Meadow Creek, Albemarle County and Charlottesville, Virginia.
W75-10564 4A

MEADOW GRASSES
Effectiveness of Precipitation in a Mountain Meadow,
W75-10799 2D

MEASUREMENT
Multichannel Toxicant Injection System for Flow-Through Bioassays,
W75-10443 5A

Error Analysis of Dobson Spectrophotometer Measurements of the Total Atmospheric Ozone Content,
W75-10545 7B

MEAT PROCESSING WASTES
Analysis of Wastewater Treatment Systems for a Meat Processing Plant,
W75-10687 5D

MECHANICAL PROPERTIES
Hydraulics and Mechanics of River Ice Jams,
W75-10556 8B

MEDAKA
Residue Analyses on 2-Amino-4 Phenylthiazole, a Piscine Anesthetic, in Fishes-I a Model Radio-Tracer Experiment with Medaka,
W75-10614 5A

MERCURY
Effects of Methylmercury on Approach and Avoidance Behavior of Mallard Ducklings,
W75-10424 5C

Heavy Metal Contents of Fishes Caught in Kaohsiung Harbor, (In Chinese),
W75-10430 5A

The Biological Half-Life of Inorganic Mercury in the Dungeness Crab (Cancer magister),
W75-10437 5C

Experimental Investigation on the Biological Concentration of Mercury-I. On the Rate of Mercury Transfer Through the Food Chain From Jack Mackerel to Young Yellowtail (In Japanese),
W75-10441 5C

Redistribution and Concentration of Mercury in the Environment,
W75-10483 5B

The Determination of Mercury in Soils and Related Materials by Cold-Vapour Atomic Absorption Spectrometry,
W75-10485 5A

The Concentration of Mercury, Copper, Nickel, Silver, Cadmium and Lead in the Northern Adriatic Anchovy, Engraulis Encrasicholus, and Sardine, Sardina Pilchardus,
W75-10620 5B

METABOLISM

Effects of Acute Exposure to Bleached Kraft Pulp Mill Effluent on Carbohydrate Metabolism of Juvenile Coho Salmon (Oncorhynchus Kisutch) During Rest and Exercise,
W75-10388 5C

Studies on the Metabolism of Chlorophenols in Fish-I Absorption and Excretion of PCP by Goldfish,
W75-10417 5C

Uptake of Three Polychlorinated Biphenyls, DDT and DDE by the Green Sunfish, Lepomis Cyanellus Raf.,
W75-10422 5C

Decrease of Net Carbon Flux in Two Species of Mussels Caused by Extracts of Crude Oil,
W75-10433 5C

Persistence of Cadmium-Induced Metabolic Changes in Liver and Kidney,
W75-10478 5A

Characterization of Cadmium Uptake by Plant Tissue,
W75-10479 5B

Lead Metabolism in the Normal Human: Stable Isotope Studies,
W75-10484 5A

Copper, Zinc and Total Protein Levels in the Plasma of Sockeye Salmon (Oncorhynchus Nerka) During Their Spawning Migration,
W75-10613 5C

Absorption, Metabolism, and Excretion by Goldfish of the Anionic Detergent Sodium Lauryl Sulphate,
W75-10626 5C

METALS

Determination of the Transition Metals Manganese, Iron, Cobalt, Copper and Zinc in River Fishes With Help of X-Ray Fluorescence Analysis and Flameless Atomic Absorption Spectroscopy, (Bestimmung der Ubergangsmetalle Mangan, Eisen, Kobalt, Kupfer und zink in Flussfischen mit Hilfe der Rontgenfluores-zenzanalyse und der flammenlosen Atomabsorption),
W75-10408 5A

The Effect of Different Salinities and Manganese Ion on the Survival Respiration of the Baltic Flounder (Pleuronectes Flesus Trachurus (Dunker)) of the Gulf of Riga,
W75-10411 5C

Average Trace Element Composition of Low Level Marine Atmospheric Particulates,
W75-10477 5B

NBS Adds Foreign Wrinkle to Standards Work,
W75-10490 5A

Gravity Dewatering of Metal Hydroxide Sludges,
W75-10500 5D

Water Quality Criteria for European Freshwater Fish.
W75-10610 5C

METHODOLOGY

Determination of the Transition Metals Manganese, Iron, Cobalt, Copper and Zinc in River Fishes With Help of X-Ray Fluorescence Analysis and Flameless Atomic Absorption Spectroscopy, (Bestimmung der Ubergangsmetalle Mangan, Eisen, Kobalt, Kupfer und zink in Flussfischen mit Hilfe der Rontgenfluores-zenzanalyse und der flammenlosen Atomabsorption),
W75-10408 5A

Panel Review of the Taxonomic Structure of the Straw Man.
W75-10806 6B

Panel Evaluation of the Logical Structure, Consistency, and Underlying Assumptions of the 'Strawman' Methodology.
W75-10807 6B

Comments on the Straw Man,
W75-10808 6B

Report to the Technical Committee of the Water Resources Centers of the Thirteen Western States,
W75-10809 6B

Proceedings of the Graduate Student Symposium of the Technical Committee of the Water Resources Centers of the Thirteen Western States.
W75-10810 6A

Social Indicators and Connectives,
W75-10812 6A

Towards a Sharper Concept of an Action Variable,
W75-10813 6A

Methodological Problems in Applying the Straw Man to Real Life Problems,
W75-10814 6A

Necessary Adaptations for Significant Utilization of the Information System,
W75-10816 6A

A Method of Disaggregation,
W75-10817 6A

Algorithmic Modeling and the Straw Man,
W75-10820 6A

METHYL MERCURY

Experimental Investigation on the Biological Concentration of Mercury-I. On the Rate of Mercury Transfer Through the Food Chain From Jack Mackerel to Young Yellowtail (In Japanese),
W75-10441 5C

MEXICALI VALLEY

Wellton-Mohawk Drainage and the Mexican Salt Problem,
W75-10783 4A

MEXICAN WATER TREATY

The Lower Colorado River: A Bibliography,
W75-10453 10C

MEXICO

Wellton-Mohawk Drainage and the Mexican Salt Problem,
W75-10783 4A

MICHIGAN

Flood Plain Information: Upper River Rouge, Minnow Pond Drain, Bell Branch and Tarabusi Creek, Wayne and Oakland Counties, Michigan.
W75-10575 4A

Toxicity of Chlorinated Municipal Wastes to Fish: An Evaluation Based on Michigan Field Data,
W75-10680 5C

MICROBIAL DEGRADATION

Environmental Limitations on the Microbial Degradation of Hydrocarbons in Temperate Lakes,
W75-10407 5C

Adsorption and Degradation of Chlorbromuron in Soil,
W75-10414 5B

MICROORGANISMS

Deterioration of Water Quality in Distribution Systems,
W75-10711 5F

The Effect of the Quantity of Silt to the Attached Microorganisms of the Kuzuryu-Gawa River in the Hokuriku District, (In Japanese),
W75010696 5C

MIDGES

Uptake, Elimination and Biotransformation of the Lampricide 3-Trifluromethyl-4-Nitrophenol (TFM) by Larvae of the Aquatic Midge Chironomus Tentans,
W75-10629 5C

Acute Toxicities of 3-Trifluoromethyl-4-Nitrophenol (TFM) and 2',5-Dichloro-4'-Nitrosalicylanilide (Bayer 73) to Larvae of the Midge (Chironomus Tentans),
W75-10698 5C

MILK TRUCK WASHINGS

Treatment of Milk Truck Washing Wastes by Anerobic Digestion,
W75-10673 5D

MILL RUN (PA)

Flood Plain Information: Mill Run, Blair County, Pennsylvania.
W75-10568 4A

MINE WASTES

Thallium: Occurrence in the Environment and Toxicity to Fish,
W75-10449 5C

MINERALS LOCATION
International Exploration Locates Minerals and Oils,
W75-10467 5B

MIRAMICHI RIVER (NEW BRUNSWICK)
Temperature-Induced Changes in Acute Toxicity of Zinc to Atlantic Salmon (Salmo salar),
W75-10431 5C

MIREX
Effects of Mirex on the Larval Development of Blue Crab,
W75-10410 5C

A Gravity-Flow Column to Provide Pesticide-Laden Water for Aquatic Bioassays,
W75-10844 5A

MISSISSIPPI
Special Flood Hazard Information Report: Chickasawhay River, Waynesboro, Wayne County, Mississippi.
W75-10569 4A

Water for Industrial Development in Alcorn, Itawamba, Prentiss, and Tishomingo Counties, Mississippi,
W75-10581 3E

Low-Flow Characteristics of Mississippi Streams,
W75-10605 2E

MISSISSIPPI RIVER
Evaluation of Three Side Channels and the Main Channel Border of the Middle Mississippi River as Fish Habitat,
W75-10451 5C

MISSOURI
Harry S. Truman Dam and Reservoir, Osage River, Missouri, Apendix A (Final Environmental Impact Statement).
W75-10363 8A

Recurrence Intervals of Annual Minimum Streamflows,
W75-10530 2E

MIXED DISTRIBUTIONS
A Note on Mixed Distributions in Hydrology,
W75-10527 2E

A Two-Distribution Method for Fitting Mixed Distributions in Hydrology,
W75-10531 2E

MODEL STUDIES
Proceedings Symposium on Statistical Hydrology.
W75-10507 2A

Multisite Streamflow Simulation of Truckee River, Nevada,
W75-10509 2E

A Precipitation Data Simulator Using a Second Order Autoregressive Scheme,
W75-10513 2B

Hourly Rainfall Generation for a Network,
W75-10515 2B

Stochastic Generation of the Occurrence, Pattern, and Location of Maximum Amount of Daily Rainfall,
W75-10516 2B

A Stochastic Model for Daily Rainfall Data Synthesis,
W75-10518 2B

Stochastic Models of Spatial and Temporal Distribution of Thunderstorm Rainfall,
W75-10519 2B

Stochastic Model of Daily Rainfall,
W75-10520 2B

An Event-Based Stochastic Model of Areal Rainfall and Runoff,
W75-10521 2B

Research in Stochastic Models for Bedload Transport,
W75-10522 2J

Use of Autoregressive Runoff Models in Reservoir Studies,
W75-10523 2E

A Stochastic Model of Sediment Yield for Ephemeral Streams,
W75-10524 2J

Statistical Inference on Streamflow Processes with Markovian Characteristics,
W75-10525 2E

Dispersion of Contaminated Bedload Particles,
W75-10526 5B

Recurrence Intervals of Annual Minimum Streamflows,
W75-10530 2E

Physical Model Study of Circulation Patterns in Lake Ontario,
W75-10537 2H

Nonlinear Channel Routing by Computer,
W75-10543 4A

Wave Climate Model of the Mid-Atlantic Shelf and Shoreline (Virginian Sea), Model Development, Shelf Geomorphology, and Preliminary Results,
W75-10552 2L

A Numerical Model for Predicting the Effects of Landslide-Generated Water Waves,
W75-10661 8A

Los Angeles and Long Beach Harbors Model Study; Report 2, Observations of Ship Mooring and Movement,
W75-10664 8B

Lake Erie International Jetport Model Feasibility Investigation, Physical Model Feasibility Study,
W75-10670 8B

An Economic Model of Waste Oil Recovery, Reprocessing and Distribution Systems,
W75-10768 5D

Seepage from Recharge and Landfill Ditches,
W75-10770 5B

Change in Quality of Pumped Drainage Effluent,
W75-10779 5B

Groundwater Model as a Tool in Planning and Management,
W75-10781 4B

Evaluation of Agricultural Drainage in Water Quality Management,
W75-10796 5G

MODESTO IRRIGATION DISTRICT (CAL)
Automation of an Existing Irrigation System - Part I,
W75-10788 8C

MOISTURE STRESS
Effects of Soil Moisture on Stress on 2 Varieties of Upland Cotton in Israel: IV. Effects of Periods of Stress Occurrence, Correlations and Regressions,
W75-10791 3F

MOORING
Los Angeles and Long Beach Harbors Model Study; Report 2, Observations of Ship Mooring and Movement,
W75-10664 8B

MORTALITY
Acute Toxicity of Kanamycin to Steelhead Trout (Salmo Gairdneri),
W75-10423 5C

Effects of Heavy Metals and Pesticides on the Mass Mortalities of Cultured Shellfishes Along the Southwest Coast of Taiwan, (In Chinese),
W75-10427 5C

Effects of Temperature on Development and Survival of Rainbow Trout, Salmo Gairdneri, in Acid Waters,
W75-10623 5C

MOSQUITO CONTROL
Biological Activity of Organophosphorus Compounds and Synthetic Pyrethroids Against Immature Mosquitoes,
W75-10631 5G

MOTOR BOATS
Analysis of Pollution from Marine Engines - Status Report,
W75-10688 5A

MUGIL CEPHALUS
Critical Thermal Maxima of Three Species of Hawaiian Estuarine Fish: A Comparative Study,
W75-10426 5C

MULTIVARIATE ANALYSIS
General Aspects of Multivariate Analysis with Applications to Some Problems in Hydrology,
W75-10510 2A

MUNICIPAL WASTES
Process Design Manual for Upgrading Existing Waste Water Treatment Plants.
W75-10396 5D

Toxicity of Chlorinated Municipal Wastes to Fish: An Evaluation Based on Michigan Field Data,
W75-10680 5C

Waste Automotive Lubricating Oil as a Municipal Incinerator Fuel,
W75-10764 5D

MUNICIPAL WATER
Economic Impact of the Conversion of Water from Irrigation to Municipal and Industrial Use in the Rio Grande Basin of New Mexico,
W75-10771 6D

Impacts of Rural to Urban Water Use,
W75-10772 6D

MUSKEGON (MI)
Land Treatment of Municipal Sewage,
W75-10719 5D

MUSSELS
Decrease of Net Carbon Flux in Two Species of Mussels Caused by Extracts of Crude Oil,
W75-10433 5C

MYTILUS EDULIS
Effects of the Insecticide Sevin and Its First Hydrolytic Product, 1-Napthol, on Some Early Developmental Stages of the Bay Mussel, Mytilus edulis,
W75-10435 5C

NAVIGATION
Navigation Conditions at Cannelton Locks and Dam, Ohio River; Hydraulic Model Investigation,
W75-10667 8B

NEBRASKA
Groundwater Control by Pumping,
W75-10778 4B

Groundwater Model as a Tool in Planning and Management,
W75-10781 4B

NETWORK DESIGN
Computer Simulation of Water Distribution Networks,
W75-10823 4A

NETWORKS
Hourly Rainfall Generation for a Network,
W75-10515 2B

NEUTRALIZATION
Some Observations on Spawning of Brook Trout (Salvelinus Fontinalis Mitchill) in Lime Neutralized Iron Hydroxide Suspensions,
W75-10445 5C

NEUTRON ACTIVATION ANALYSIS
Determination of Nickel in Rocks After Epithermal Neutron Activation,
W75-10493 2K

NEVADA
Multisite Streamflow Simulation of Truckee River, Nevada,
W75-10509 2E

NEW JERSEY
Flood Plain Information: Shabakunk Creek, West Branch Shabakunk and Little Shabakunk Creeks, Mercer County, New Jersey.
W75-10572 4A

NEW MEXICO
Ground-Water Levels in New Mexico, 1972,
W75-10582 4B

Economic Impact of the Conversion of Water from Irrigation to Municipal and Industrial Use in the Rio Grande Basin of New Mexico,
W75-10771 6D

Water Use and Production of Trickle Irrigated Onions,
W75-10785 3F

NEW YORK
Norton Point Dike Study, Coney Island, New York; Hydraulic Model Investigation,
W75-10662 8B

Treatment of Winery Wastes by Aerated Lagoon, Activated Sludge, and Rotating Biological Contractor,
W75-10685 5D

NEW YORK (NY)
Waste Oil: The Recapture of an Energy Resource (The Generation, Disposal and Recovery of Waste Oil in the New York Metropolitan Area),
W75-10745 5D

NICKEL
Heavy Metal Contents of Fishes Caught in Kaohsiung Harbor, (In Chinese),
W75-10430 5A

Determination of Nickel in Rocks After Epithermal Neutron Activation,
W75-10493 2K

The Concentration of Mercury, Copper, Nickel, Silver, Cadmium and Lead in the Northern Adriatic Anchovy, Engraulis Encrasicholus, and Sardine, Sardina Pilchardus,
W75-10620 5B

NITROGEN
Environmental Limitations on the Microbial Degradation of Hydrocarbons in Temperate Lakes,
W75-10407 5C

Responses of 'Bearss' Lemon to Nitrogen, Potassium and Irrigation Applications,
W75-10714 3F

An Evaluation of Persistency for Water Borne Organics,
W75-10850 5B

NITROGEN COMPOUNDS
Urea in the Waters of Lake Kinneret (Sea of Galilee),
W75-10420 5C

NITROGEN CYCLE
Urea in the Waters of Lake Kinneret (Sea of Galilee),
W75-10420

NORTH AMERICA
Some Features of Tsunamis on the Pacific Coast of South and North America,
W75-10554 2L

NORTH CAROLINA
A Precipitation Data Simulator Using a Second Order Autoregressive Scheme,
W75-10513 2B

Sediment Characteristics of Streams in the Eastern Piedmont and Western Coastal Plain Regions of North Carolina,
W75-10586 2J

Hydrology of the Albemarle-Pamlico Region, North Carolina--A Preliminary Report on the Impact of Agricultural Developments,
W75-10602 4C

Relationships Between Drouth and Corn Yields on Selected South Atlantic Coastal Plain Soils,
W75-10721 3F

NORTH DAKOTA
Drainage Analysis of a Confining Formation,
W75-10780 4A

NORTON POINT DIKE (NY)
Norton Point Dike Study, Coney Island, New York; Hydraulic Model Investigation,
W75-10662 8B

NUCLEAR POWERPLANTS
Nuclear Power Plant Cooling System Selection,
W75-10822 6C

NUTRIENT SOURCES
Will Wastewater Treatment Stop Eutrophication of Impoundments,
W75-10686 5D

NUTRIENTS
An Investigation of the Ecology and Water Quality of a Lake Outlet,
W75-10724 5C

OCEAN WAVES
Laboratory Measurement of Surface Temperature Fluctuations Induced by Small Amplitude Surface Waves,
W75-10505 2L

On the Joint Distribution of the Periods and Amplitudes of Sea Waves,
W75-10534 2L

Wave Climate Model of the Mid-Atlantic Shelf and Shoreline (Virginian Sea), Model Development, Shelf Geomorphology, and Preliminary Results,
W75-10552 2L

OCEANS
Average Trace Element Composition of Low Level Marine Atmospheric Particulates,
W75-10477 5B

Oil in the Sea.
W75-10640 5B

OFFSHORE DRILLING
Icebreaking Drillship for Offshore Exploratory Drilling in the Arctic,
W75-10639 5G

OHIO
Lake Erie International Jetport Model Feasibility Investigation, Physical Model Feasibility Study,
W75-10670 8B

OHIO RIVER
Summary Appraisals of the Nation's Ground-Water Resources--Ohio Region,
W75-10598 4B

Navigation Conditions at Cannelton Locks and Dam, Ohio River; Hydraulic Model Investigation,
W75-10667 8B

OHIO RIVER REGION
Summary Appraisals of the Nation's Ground-Water Resources--Ohio Region,
W75-10598 4B

OIL
Decrease of Net Carbon Flux in Two Species of Mussels Caused by Extracts of Crude Oil,
W75-10433 5C

The Effects of a No. 2 Fuel Oil and Two Crude Oils on the Growth and Photosynthesis of Microalgae,
W75-10436 5C

International Exploration Locates Minerals and Oils,
W75-10467 5B

Icings Along the Trans-Alaska Pipeline Route,
W75-10592 2C

Channel Erosion Surveys Along Southern Segment of the Taps Route, Alaska, 1972 and 1973,
W75-10594 8B

Icebreaking Drillship for Offshore Exploratory Drilling in the Arctic,
W75-10639 5G

Oil in the Sea.
W75-10640 5B

The Source and Supply of Virgin Lubes,
W75-10741 5B

Disposal of Used Crankcase and Other Oils in Canada,
W75-10743 5D

Waste Oil in Maryland: A Pollutant or a Resource,
W75-10744 5B

Waste Oil: The Recapture of an Energy Resource (The Generation, Disposal and Recovery of Waste Oil in the New York Metropolitan Area),
W75-10745 5D

Waste Lubricating Oil Characteristics--Do They Vary Geographically, Seasonally, and With Origin,
W75-10746 5B

Quality Products from Used Petroleum Oils,
W75-10756 5D

Waste Oil--Solution to Maryland's Energy Crisis,
W75-10762 5D

Waste Automotive Lubricating Oil as a Municipal Incinerator Fuel,
W75-10764 5D

Runoff of Oils from Rural Roads Treated to Suppress Dust,
W75-10766 5B

OIL BOOMS

Civil Engineering Laboratory Develops Universal Connector for All Booms.
W75-10468 5G

OIL INDUSTRY

Oil Reuse--A National Need,
W75-10740 5D

The Source and Supply of Virgin Lubes,
W75-10741 5B

Waste Oil Management--The Environmental Protection Agency's Role,
W75-10742 5G

Waste Oil in Maryland: A Pollutant or a Resource,
W75-10744 5B

Waste Lubricating Oil Characteristics--Do They Vary Geographically, Seasonally, and With Origin,
W75-10746 5B

Quality Products from Used Petroleum Oils,
W75-10756 5D

The Waste Oil Industry: A Discussion of Some Issues to Consider in Performing an Economic Analysis,
W75-10767 5G

OIL POLLUTION

Environmental Limitations on the Microbial Degradation of Hydrocarbons in Temperate Lakes,
W75-10407 5C

USCG Sets Broader Use of Pollution Control Systems,
W75-10466 5G

Marine Floating Screen.
W75-10634 5G

Recovering Oil Spills from Water.
W75-10635 5G

Oil in the Sea.
W75-10640 5B

The Effect of Crude Oil Fractions on the Survival of a Tidepool Copepod, Tigriopus Californicus,
W75-10641 5C

Oil and Debris Removal Unit,
W75-10726 5G

Oil Separation and Recovery Device,
W75-10728 5G

Proceedings of the International Conference on Waste Oil Recovery and Reuse.
W75-10739 5D

Oil Reuse--A National Need,
W75-10740 5D

Disposal and/or Recycle of Air Force Waste Petroleum Oils and Lubricants,
W75-10749 5D

Oily Bilge from Commercial Vessels,
W75-10752 5B

Characteristics of Oil Pollution in and Around U.S. Waters,
W75-10754 5B

A Program for Handling Emergency Oil Spillages in the Port of Baltimore,
W75-10755 5G

Runoff of Oils from Rural Roads Treated to Suppress Dust,
W75-10766 5B

OIL SPILLS

USCG Sets Broader Use of Pollution Control Systems,
W75-10466 5G

Civil Engineering Laboratory Develops Universal Connector for All Booms.
W75-10468 5G

Jettisoning of LNG at Sea--An Unresolved Pollution Hazard.
W75-10633 5G

Marine Floating Screen.
W75-10634 5G

Recovering Oil Spills from Water.
W75-10635 5G

Effects of an Offshore Crude Oil Unloading Terminal on the Marine Environment,
W75-10642 5C

Oil and Debris Removal Unit,
W75-10726 5G

Oil Separation and Recovery Device,
W75-10728 5G

Containment, Collection and Recycling of Oily Wastes,
W75-10747 5G

A Program for Handling Emergency Oil Spillages in the Port of Baltimore,
W75-10755 5G

A Remote Sensing Laser Fluorometer,
W75-10831 5A

OIL WASTES

The Effect of Crude Oil Fractions on the Survival of a Tidepool Copepod, Tigriopus Californicus,
W75-10641 5C

Proceedings of the International Conference on Waste Oil Recovery and Reuse.
W75-10739 5D

Oil Reuse--A National Need,
W75-10740 5D

The Source and Supply of Virgin Lubes,
W75-10741 5B

Waste Oil Management--The Environmental Protection Agency's Role,
W75-10742 5G

Disposal of Used Crankcase and Other Oils in Canada,
W75-10743 5D

Waste Oil in Maryland: A Pollutant or a Resource,
W75-10744 5B

Waste Oil: The Recapture of an Energy Resource (The Generation, Disposal and Recovery of Waste Oil in the New York Metropolitan Area),
W75-10745 5D

Waste Lubricating Oil Characteristics--Do They Vary Geographically, Seasonally, and With Origin,
W75-10746 5B

Containment, Collection and Recycling of Oily Wastes,
W75-10747 5G

Environmental Action at Port Authority Airports,
W75-10748 5G

Disposal and/or Recycle of Air Force Waste Petroleum Oils and Lubricants,
W75-10749 5D

The Navy's Oily Wastes Handling and Disposal Program,
W75-10750 5D

Port Reception and Treatment Facilities for Oily Waste from Vessels,
W75-10751 5G

Shipyard Problems with Oily Wastes,
W75-10753 5B

Characteristics of Oil Pollution in and Around U.S. Waters,
W75-10754 5B

Quality Products from Used Petroleum Oils,
W75-10756 5D

The Economics of Re-Refining,
W75-10757 5G

Pollution Control with a Comprehensive Waste Oil Processing Plant,
W75-10758 5D

Experience with the IFP Propane Clarification Process in Re-Refining Spent Crankcase Oils,
W75-10759 5D

Re-Refined Diesel Locomotive Lubricating Oil,
W75-10761 5D

Waste Oil--Solution to Maryland's Energy Crisis,
W75-10762 5D

Massachusetts Waste Oil Management Activities,
W75-10763 5D

The Waste Oil Industry: A Discussion of Some Issues to Consider in Performing an Economic Analysis,
W75-10767 5G

OIL-WATER INTERFACES
Feasibility Test Program of Application of Coalescing Phase Oil/Water Separators to Self Compensating Fuel Tanks in Surface Ships,
W75-10474 5G

OIL/WATER SEPARATORS
Feasibility Test Program of Application of Coalescing Phase Oil/Water Separators to Self Compensating Fuel Tanks in Surface Ships,
W75-10474 5G

OILY WATER
Feasibility Test Program of Application of Coalescing Phase Oil/Water Separators to Self Compensating Fuel Tanks in Surface Ships,
W75-10474 5G

Containment, Collection and Recycling of Oily Wastes,
W75-10747 5G

Environmental Action at Port Authority Airports,
W75-10748 5G

The Navy's Oily Wastes Handling and Disposal Program,
W75-10750 5D

Port Reception and Treatment Facilities for Oily Waste from Vessels,
W75-10751 5G

Oily Bilge from Commercial Vessels,
W75-10752 5B

Shipyard Problems with Oily Wastes,
W75-10753 5B

Characteristics of Oil Pollution in and Around U.S. Waters,
W75-10754 5B

A Program for Handling Emergency Oil Spillages in the Port of Baltimore,
W75-10755 5G

Oil Contaminated Water Recycling System,
W75-10760 5D

OKLAHOMA
Water Reuse in a Paper Reprocessing Plant,
W75-10401 5D

General Aspects of Multivariate Analysis with Applications to Some Problems in Hydrology,
W75-10510 2A

Stochastic Generation of the Occurrence, Pattern, and Location of Maximum Amount of Daily Rainfall,
W75-10516 2B

OLEFIN SULFONATE
Effect of a Mixture of Succinic Acid Mono-Sulpho-Ester and Olefin Sulfonate on Fish (Uber die Wirkung einer Mischung von Sulfobernsteinsaure-halbester und Olefinsulfonat auf Fische),
W75-10409 5C

ONIONS
Water Use and Production of Trickle Irrigated Onions,
W75-10785 3F

OPEN CHANNEL FLOW
Waimano Stream Flood Control Project, Pearl City, Hawaii; Hydraulic Model Investigation,
W75-10663 8B

Spillway for Burnsville Dam, Little Kanawha River, West Virginia; Hydraulic Model Investigation,
W75-10665 8B

OPERATING COSTS
Process Design Manual for Sludge Treatment and Disposal.
W75-10475 5D

Derivation of Reservoir Operating Rules by Economic Analysis,
W75-10825 4A

OPERATIONS
Operational Value of Weather Information in Relation to Soil Management Characteristics,
W75-10367 2G

Process Design Manual for Upgrading Existing Waste Water Treatment Plants.
W75-10396 5D

OPPORTUNITY COST
Principles and standards for Water Planning,
W75-10355 6B

The Economic Impact of Mercury Pollution on Fisheries and Other Related Businesses Around Pickwick Lake,
W75-10356 5G

OPTIMIZATION
Vacuum Filtration Cost Optimization,
W75-10681 5D

Optimal Sizing of Urban Flood-Control Systems,
W75-10821 4A

ORGANIC COMPOUNDS
Organic Compounds in Pulp Mill Lagoon Discharge,
W75-10402 5D

Effect of a Mixture of Succinic Acid Mono-Sulpho-Ester and Olefin Sulfonate on Fish (Uber die Wirkung einer Mischung von Sulfobernsteinsaure-halbester und Olefinsulfonat auf Fische),
W75-10409 5C

Studies on the Metabolism of Chlorophenols in Fish-I Absorption and Excretion of PCP by Goldfish,
W75-10417 5C

Studies on the Metabolism of Chlorophenols in Fish-II Turnover in Absorbed PCP in Goldfish,
W75-10418 5C

Analysis of Tri-Aryl Phosphate Esters and the Determination of Imol S-140 in Fish Tissue and Water Samples by Gas Chromatography,
W75-10442 5A

Effects of pH on Toxicity of Antimycin to Fish,
W75-10450 5C

Studies on the Metabolism of Chlorophenols in Fish-III Isolation and Identification of a Conjugated PCP Excreted by Goldfish,
W75-10611 5A

Uptake, Elimination and Biotransformation of the Lampricide 3-Trifluromethyl-4-Nitrophenol (TFM) by Larvae of the Aquatic Midge Chironomus Tentans,
W75-10629 5C

An Evaluation of Persistency for Water Borne Organics,
W75-10850 5B

ORGANIC LOADING
An Investigation of the Ecology and Water Quality of a Lake Outlet,
W75-10724 5C

ORGANIC MATTER
Organic Matter in Natural Water and Water Treatment,
W75-10351 5B

ORGANIC NITROGEN
Urea in the Waters of Lake Kinneret (Sea of Galilee),
W75-10420 5C

ORGANIC PESTICIDES
On the Accumulation of Organochlorine Pesticides, PCB and Certain Heavy Metals in Fish and Shellfish from Thai Coastal and Inland Waters,
W75-10616 5B

ORGANIC WASTES
The Effect of Certain Organic Pollutants on Copper Toxicity to Fish (Lebistes Reticulatus),
W75-10637 5C

ORGANOLEPTIC PROPERTIES
The Effects of Crude Oil on the Palatability of Marine Crustaceans,
W75-10428 5C

ORGANOPHOSPHORUS COMPOUNDS
Toxic Effects of an Anionic Detergent on the Gills of Rainbow Trout,
W75-10434 5C

Toxicity of Paired Mixtures of Candidate Forest Insecticides to Rainbow Trout,
W75-10439 5C

Analysis of Tri-Aryl Phosphate Esters and the Determination of Imol S-140 in Fish Tissue and Water Samples by Gas Chromatography,
W75-10442 5A

Biological Activity of Organophosphorus Compounds and Synthetic Pyrethroids Against Immature Mosquitoes,
W75-10631 5G

ORGANOPHOSPHORUS PESTICIDES
Toxicity of Phosphamidon to American Lobsters (Homarus Americanus) Held at 4 and 12C,
W75-10413 5C

ORLANDO (FL)
Analysis of a Large Water Distribution System Using Advanced Computer Software,
W75-10720 4A

OSMOREGULATION
DDT : Short Term Effects on Osmoregulation in Black Surfperch (Embiotoca Jacksoni),
W75-10429 5C

OUACHITA RIVER (ARK)
Flood Plain Information: Ouachita River, Hot Springs Creek, Stokes Creek, Molly Creek, Gulpha Creek, City of Hot Springs, Arkansas.
W75-10559 4A

OUTLET WORKS
Spillway for Burnsville Dam, Little Kanawha River, West Virginia; Hydraulic Model Investigation,
W75-10665 8B

Turbulent Flow in Rectangular Outlet Conduit, Rend Lake Dam, Big Muddy River, Illinois,
W75-10666 8B

OVERFLOW
Coping With Urban Runoff in the United States,
W75-10541 5D

OXIDATION LAGOONS
Waste Water Treatment: Lagoons and Oxidation Ponds,
W75-10374 5D

OXYGEN
Effect of the Insecticide Zectran (Mexacarbate) on Several Algae,
W75-10425 5C

Importance of Plants in Oxygen Production, Carbon Dioxide Consumption and Air Purification,
W75-10715 2I

OXYGEN DEMAND
An Evaluation of Persistency for Water Borne Organics,
W75-10850 5B

OYSTERS
Effects of Heavy Metals and Pesticides on the Mass Mortalities of Cultured Shellfishes Along the Southwest Coast of Taiwan, (In Chinese),
W75-10427 5C

The Effect of Prolonged Exposure to Elevated Temperatures on the Biochemical Constituents, Gonadal Development and Shell Deposition of the American Oyster, Crassostrea Virginica,
W75-10849 5C

OZONE
Error Analysis of Dobson Spectrophotometer Measurements of the Total Atmospheric Ozone Content,
W75-10545 7B

Treatment of Service Water with Ozone,
W75-10840 5D

P. L. 92-500
P. L. 92-500 (Two Years Later) is Not the Answer,
W75-10471 5G

PACIFIC OCEAN
Some Features of Tsunamis on the Pacific Coast of South and North America,
W75-10554 2L

PATENTS
Liquefying Refrigerant for Water Desalination with Liquefied Natural Gas and an Intermediate Energy Cycle,
W75-10725 3A

Oil and Debris Removal Unit,
W75-10726 5G

Water Collection and Storage Dispersion Apparatus,
W75-10727 4A

Oil Separation and Recovery Device,
W75-10728 5G

Integral Circular Wastewater Treatment Plant,
W75-10729 5D

Method of Treating Aluminum-Containing Waste Water,
W75-10730 5D

Process for Removing Heavy Metal Ions in Water,
W75-10731 5D

Air and Water Pollution Control,
W75-10732 5D

Rotary Desalination Engine and System,
W75-10733 3A

Geothermal Channel and Harbor Ice Control System,
W75-10734 4A

Closed Recycling System for Water Purification and Waste Reduction,
W75-10735 5D

Removal of Pollutants from Water,
W75-10736 5D

Method of Purification of Waste Water Produced From the Packing of Meat and Aquatic Animals,
W75-10737 5D

Multiple Cycle Process for Wastewater Purification,
W75-10738 5D

Geothermal Power Plant with High Efficiency,
W75-10845 8C

PATH OF POLLUTANTS
Experimental Investigation on the Biological Concentration of Mercury-I. On the Rate of Mercury Transfer Through the Food Chain From Jack Mackerel to Young Yellowtail (In Japanese),
W75-10441 5C

Residues of Polychlorinated Biphenyls (PCB) and Chlorinated Pesticides in Fish and Birds of the Po Delta, (Residus de Polychlorobiphenyls (PCB) et de Pesticides Chlores Dans Les Poissons et Les Oiseaux du Delta du Po),
W75-10446 5B

Ocean Pollutants Pose Potential Danger to Man,
W75-10464 5B

Average Trace Element Composition of Low Level Marine Atmospheric Particulates,
W75-10477 5B

Redistribution and Concentration of Mercury in the Environment,
W75-10483 5B

Dispersion of Contaminated Bedload Particles,
W75-10526 5B

Prediction of Trifluralin Diffusion Coefficients,
W75-10542 5B

Absorption, Metabolism, and Excretion by Goldfish of the Anionic Detergent Sodium Lauryl Sulphate,
W75-10626 5C

Water Pollution Problems Associated with Control of Stack Gas Emission,
W75-10691 5B

Runoff of Oils from Rural Roads Treated to Suppress Dust,
W75-10766 5B

Seepage from Recharge and Landfill Ditches,
W75-10770 5B

ACTMO, An Agricultural Chemical Transport Model,
W75-10846 5B

PATUXENT RIVER (MD)
Daily Temperature and Salinity of Surface Water of Patuxent River at Solomons, Maryland, Based on 30 Years of Records (1938-1967),
W75-10535 2E

PCP
Studies on the Metabolism of Chlorophenols in Fish-III Isolation and Identification of a Conjugated PCP Excreted by Goldfish,
W75-10611 5A

PEAK-LOAD PRICING
On the Peak-Load Pricing of Urban Water Supply,
W75-10706 6C

PEAK LOADS
On the Peak-Load Pricing of Urban Water Supply,
W75-10706 6C

PEARSON TYPE III DISTRIBUTION
Statistical Tolerance Limits for a Pearson Type III Distribution,
W75-10511 2E

PEAT
Measurement of Hydraulic Conductivity of Peats,
W75-10536 7B

PEDOCALS
Pedologic Cover of the Watershed of the Porecka River,
W75-10551 2A

PENNSYLVANIA
Flood Plain Information: Bushkill Creek, Vicinity of Easton, Pennsylvania.
W75-10560 4A

Flood Plain Information: Bloomsburg, Columbia County, Pennsylvania-Susquehanna River.
W75-10561 4A

Flood Plain Information: Brandywine Creek, Chester County, Pennsylvania.
W75-10562 4A

Flood Plain Information: Mill Run, Blair County, Pennsylvania.
W75-10568 4A

Flood Plain Information: West Branch Susquehanna River, Lycoming County, Pennsylvania.
W75-10576 4A

PENTA-CHLOROPHENOL (PCP)
Studies on the Metabolism of Chlorophenols in Fish-I Absorption and Excretion of PCP by Goldfish,
W75-10417 5C

PENTACHLOROPHENOL
Studies on the Metabolism of Chlorophenols in Fish-II Turnover in Absorbed PCP in Goldfish,
W75-10418 5C

PERCHES
DDT : Short Term Effects on Osmoregulation in Black Surfperch (Embiotoca Jacksoni),
W75-10429 5C

PERCOLATION
A Climatological Analysis of North Polar Desert Areas,
W75-10455 2C

PERFORMANCE
Increasing the Efficiency of Flotation Savealls (Povyshenie effektivnosti raboty flotatsionnykh lovushek),
W75-10369 5D

Swimming Performance of Juvenile Coho Salmon (Oncorhynchus Kisutch) Exposed to Bleached Kraft Pulp Mill Effluent,
W75-10387 5C

Plant Performance Using Dissolved Oxygen Control,
W75-10452 5D

PERIODICITY
Removal of Periodicities by Differencing and Monthyl Mean Subtraction,
W75-10352 2A

PERMAFROST
Geomorphic Processes in Polar Deserts,
W75-10456 2C

PERMEABILITY
DDT : Short Term Effects on Osmoregulation in Black Surfperch (Embiotoca Jacksoni),
W75-10429 5C

The Effect of Heavy Metals on Photosynthesis and Loss of Cell Potassium in Two Species of Marine Algae, Dunaliella tertiolecta and Phaeodactylum tricornutum,
W75-10447 5C

PEROXIDE BLEACHING
Spent Liquor From Peroxide Bleaching of Groundwood Pulp From Spruce,
W75-10392 5A

PERSISTANCE
An Evaluation of Persistency for Water Borne Organics,
W75-10850 5B

PESICIDE RESIDUES
Residue Analyses on 2-Amino-4 Phenylthiazole, a Piscine Anesthetic, in Fishes-I a Model Radio-Tracer Experiment with Medaka,
W75-10614 5A

PESTICIDE RESIDUES
Residues of Polychlorinated Biphenyls (PCB) and Chlorinated Pesticides in Fish and Birds of the Po Delta, (Residus de Polychlorobiphenyls (PCB) et de Pesticides Chlores Dans Les Poissons et Les Oiseaux du Delta du Po),
W75-10446 5B

PESTICIDES
Toxicity of Phosphamidon to American Lobsters (Homarus Americanus) Held at 4 and 12C,
W75-10413 5C

Effects of Heavy Metals and Pesticides on the Mass Mortalities of Cultured Shellfishes Along the Southwest Coast of Taiwan, (In Chinese),
W75-10427 5C

Effects of the Insecticide Sevin and Its First Hydrolytic Product, 1-Napthol, on Some Early Developmental Stages of the Bay Mussel, Mytilus edulis,
W75-10435 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-nitrophenol (TFM) to 10 Species of Algae,
W75-10697 5C

Acute Toxicities of 3-Trifluoromethyl-4-Nitrophenol (TFM) and 2',5-Dichloro-4'-Nitrosalicylanilide (Bayer 73) to Larvae of the Midge (Chironomus Tentans),
W75-10698 5C

Acute Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitro-Phenol (TFM) to Nymphs of Mayflies (Hexagenia Sp.),
W75-10699 5C

Toxicity and Residue Dynamics of the Lampricide 3-Trifluoro-Methyl-4-Nitrophenol (TFM) in Aquatic Invertebrates,
W75-10700 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) to the Nontarget Fish in Static Tests,
W75-10701 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) To Nontarget Fish in Flow- Through Tests,
W75-10702 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) to Selected Aquatic Invertebrates and Frog Larvae,
W75-10703 5C

A Gravity-Flow Column to Provide Pesticide-Laden Water for Aquatic Bioassays,
W75-10844 5A

An Evaluation of Persistency for Water Borne Organics,
W75-10850 5B

PETROLEUM INDUSTRY
Water-Quality Requirements for the Petroleum Industry,
W75-10465 5D

PHAEODACTYLUM TRICORNUTUM
The Effect of Heavy Metals on Photosynthesis and Loss of Cell Potassium in Two Species of Marine Algae, Dunaliella tertiolecta and Phaeodactylum tricornutum,
W75-10447 5C

PHENOLS
Analysis of Tri-Aryl Phosphate Esters and the Determination of Imol S-140 in Fish Tissue and Water Samples by Gas Chromatography,
W75-10442 5A

Studies on the Metabolism of Chlorophenols in Fish-III Isolation and Identification of a Conjugated PCP Excreted by Goldfish,
W75-10611 5A

PHILIPPINE ISLANDS
Phosphorus Availability of Some Philippine Rice Soils as Affected by Soil and Water Management Practices,
W75-10421 3F

PHOENIX (ARIZ)
Utilization of Sewage Effluent for Irrigation,
W75-10798 5D

PHOSPHAMIDON
Toxicity of Phosphamidon to American Lobsters (Homarus Americanus) Held at 4 and 12C,
W75-10413 5C

PHOSPHORUS
Environmental Limitations on the Microbial Degradation of Hydrocarbons in Temperate Lakes,
W75-10407 5C

Phosphorus Availability of Some Philippine Rice Soils as Affected by Soil and Water Management Practices,
W75-10421 3F

Phosphorus in Percolates from Manured Lysimeters,
W75-10573 5B

PHOSPHORUS COMPOUNDS
Biological Activity of Organophosphorus Compounds and Synthetic Pyrethroids Against Immature Mosquitoes,
W75-10631 5G

PHOSPHORUS REMOVAL
Rate of Phosphorus Uptake by Activated Sludge,
W75-10839 5D

PHOSPHORUS UPTAKE RATE
Rate of Phosphorus Uptake by Activated Sludge,
W75-10839 5D

PHOTOPLANKTON
Urea in the Waters of Lake Kinneret (Sea of Galilee),
W75-10420 5C

PHOTOSYNTHESIS
Effect of the Insecticide Zectran (Mexacarbate) on Several Algae,
W75-10425 5C

The Effects of a No. 2 Fuel Oil and Two Crude Oils on the Growth and Photosynthesis of Microalgae,
W75-10436 5C

The Effect of Heavy Metals on Photosynthesis and Loss of Cell Potassium in Two Species of Marine Algae, Dunaliella tertiolecta and Phaeodactylum tricornutum,
W75-10447 5C

The Effect of Some Heavy Metal Ions on Photosynthesis in a Freshwater Alga,
W75-10627 5C

PHYTOPLANKTON
Effects of Chlorinated Hydrocarbon Pollutants on Growth of Marine Phytoplankton in Culture,
W75-10636 5C

PICKWICK LAKE (ALA)
Theoretical and Applied Concepts of Water Resources for Social Welfare.
W75-10354 6B

PIEDMONT REGION (NC)
Sediment Characteristics of Streams in the Eastern Piedmont and Western Coastal Plain Regions of North Carolina,
W75-10586 2J

PIGMENTS
Reclamation of Textile Printing Wastewaters for Direct Recycle,
W75-10676 5D

PIPELINES
Icings Along the Trans-Alaska Pipeline Route,
W75-10592 2C

PIPELINES

Channel Erosion Surveys Along Southern Segment of the Taps Route, Alaska, 1972 and 1973,
W75-10594 8B

800 Miles to Go,
W75-10638 5C

Computer Simulation of Water Distribution Networks,
W75-10823 4A

Pipeline Stress Analysis,
W75-10824 8B

PISCICIDES

Effects of pH on Toxicity of Antimycin to Fish,
W75-10450 5C

PLANKTON

Evaluation of Three Side Channels and the Main Channel Border of the Middle Mississippi River as Fish Habitat,
W75-10451 5C

PLANNING

Principles and standards for Water Planning,
W75-10355 6B

Flood Plain Information: White Clay Creek, New Castle County, Delaware.
W75-10571 4A

Groundwater Model as a Tool in Planning and Management,
W75-10781 4B

Panel Review of the Taxonomic Structure of the Straw Man.
W75-10806 6B

Panel Evaluation of the Logical Structure, Consistency, and Underlying Assumptions of the 'Strawman' Methodology.
W75-10807 6B

Proceedings of the Graduate Student Symposium of the Technical Committee of the Water Resources Centers of the Thirteen Western States.
W75-10810 6A

Social Indicators and Connectives,
W75-10812 6A

Towards a Sharper Concept of an Action Variable,
W75-10813 6A

Methodological Problems in Applying the Straw Man to Real Life Problems,
W75-10814 6A

Qualitative Sign Matrix Manipulation,
W75-10815 6A

Necessary Adaptations for Significant Utilization of the Information System,
W75-10816 6A

A Method of Disaggregation,
W75-10817 6A

Algorithmic Modeling and the Straw Man,
W75-10820 6A

PLANT MORPHOLOGY

An Analysis of the Mechanics of Guard Cell Motion,
W75-10488 2I

PLANT PHYSIOLOGY

The Effect of Some Heavy Metal Ions on Photosynthesis in a Freshwater Alga,
W75-10627 5C

Importance of Plants in Oxygen Production, Carbon Dioxide Consumption and Air Purification,
W75-10715 2I

PLANTING MANAGEMENT

Effect of a Phytoplankton Culture on the Germination and Seedling Development of Barley, Sugar Beets and Lettuce,
W75-10496 3F

PLASTICS

Toxic Effects of Aliphatic Chlorinated by-Products from Vinyl Chloride Production on Marine Animals,
W75-10412 5C

Tar Pollution of Sierra Leone Beaches,
W75-10472 5B

PLATTE RIVER (NEB)

Groundwater Model as a Tool in Planning and Management,
W75-10781 4B

PO RIVER (ITALY)

Residues of Polychlorinated Biphenyls (PCB) and Chlorinated Pesticides in Fish and Birds of the Po Delta, (Residus de Polychlorobiphenyls (PCB) et de Pesticides Chlores Dans Les Poissons et Les Oiseaux du Delta du Po),
W75-10446 5B

POLAR DESERTS

A Climatological Analysis of North Polar Desert Areas,
W75-10455 2C

POLAR REGIONS

Geomorphic Processes in Polar Deserts,
W75-10456 2C

Soils of the High Arctic Landscapes,
W75-10458 2C

Application of Low-Latitude Microbial Ecology to High-Latitude Deserts,
W75-10459 2C

Indigenous Peoples of Polar Deserts,
W75-10460 6D

Processes and Costs Imposed by Environmental Stress,
W75-10461 2C

POLITICAL ASPECTS

Political Participation and Water Rates. A Closer Look,
W75-10361 6C

The Lower Colorado River: A Bibliography,
W75-10453 10C

POLLUTANT IDENTIFICATION

Analytic Characterization of Sewer Loading by Spent Liquors of the Pulp Industry (Analytische Kennzeichung der Belastung der Vorfluter durch Ablaugen der Zellstoffindustrie),
W75-10381 5D

Determination of Cadmium, Copper, and Lead in Natural Waters After Anion-Exchange Separation,
W75-10385 5A

Determination of Manganese in Natural Waters by Atomic Absortion Spectrometry with a Carbon Tube Atomizer,
W75-10386 5A

X-ray Microanalysis of Zinc and Iron in the Cheloride Cells of Mayfly Larvae of the River Sulz, (Rontgenmikroanalyse von Zink und Eisen in Chloridzellen von Eintagsfligenlarven aus der Sulz),
W75-10416 5A

Marine Pollution Bioassay by Sea Urchin Eggs, An Attempt to Enhance Accuracy,
W75-10419 5A

Analysis of Tri-Aryl Phosphate Esters and the Determination of Imol S-140 in Fish Tissue and Water Samples by Gas Chromatography,
W75-10442 5A

USCG Sets Broader Use of Pollution Control Systems,
W75-10466 5G

Electron Microscope Autoradiography of Kidney After Administration of PB-210 in Mice,
W75-10476 5A

Average Trace Element Composition of Low Level Marine Atmospheric Particulates,
W75-10477 5B

Persistence of Cadmium-Induced Metabolic Changes in Liver and Kidney,
W75-10478 5A

Absorption of Cadmium, Copper and Zinc by Dog Whelks in the Bristol Channel,
W75-10481 5B

The Determination of Mercury in Soils and Related Materials by Cold-Vapour Atomic Absorption Spectrometry,
W75-10485 5A

Atomic-Absorption Spectrometric Determination of Copper, Lead, Cadmium and Manganese in Pulp and Paper by the Direct-Atomization Technique,
W75-10489 5A

NBS Adds Foreign Wrinkle to Standards Work,
W75-10490 5A

Effect of Dietary Selenium on Glutathione Peroxidase in the Chick,
W75-10495 5A

Enrichment of Surface Freshwater Microlayers with Algae,
W75-10583 5A

Studies on the Metabolism of Chlorophenols in Fish-III Isolation and Identification of a Conjugated PCP Excreted by Goldfish,
W75-10611 5A

Residue Analyses on 2-Amino-4 Phenylthiazole, a Piscine Anesthetic, in Fishes-I a Model Radio-Tracer Experiment with Medaka,
W75-10614 5A

Influence of a Thermal Effluent on Movement of Brown Bullhead (Ictalurus Nebulosus) as Determined by Ultrasonic Tracking,
W75-10628 5C

Analysis of Pollution from Marine Engines - Status Report,
W75-10688 5A

Automated Sequential Composite Sampling. A New Technique for Water Pollution Study and Control,
W75-10690 5A

Five Year Study of Des Moines River Water Quality,
W75-10803 5B

A Remote Sensing Laser Fluorometer,
W75-10831 5A

Sensitivity of Human Diploid Embryonic Lung Cells from Isolation of Echo Viruses from Sewage,
W75-10836 5C

Water Analysis of River Waters in Kagawa (IX), Chemical Composition of the Aya Water Basin, (In Japanese),
W75-10841 2K

The Toxicity of Heavy Metal Ions to Anaerobic Digestion,
W75-10843 5D

POLLUTANTS

Resource Development in Canada's High Arctic,
W75-10463 2C

POLLUTION ABATEMENT

International Production Aspects of Water and Environmental Quality Control,
W75-10357 5G

Derived Decision Rules for Pollution Control in a General Equilibrium Space Economy,
W75-10360 6C

Civil Engineering Laboratory Develops Universal Connector for All Booms.
W75-10468 5G

Suppression of Nitrogen Fixation by Blue-Green Alage in a Eutrophic Lake with Trace Additions of Copper,
W75-10480 5C

Environmental Problems Associated with the Use of Cooling Towers,
W75-10671 5D

Will Wastewater Treatment Stop Eutrophication of Impoundments,
W75-10686 5D

Proceedings of the International Conference on Waste Oil Recovery and Reuse.
W75-10739 5D

Environmental Action at Port Authority Airports,
W75-10748 5G

Port Reception and Treatment Facilities for Oily Waste from Vessels,
W75-10751 5G

POLLUTION CONTROL

Pollution Control with a Comprehensive Waste Oil Processing Plant,
W75-10758 5D

POLLUTION SENSORS

USCG Sets Broader Use of Pollution Control Systems,
W75-10466 5G

POLLUTION TAXES (CHARGES)

Pollution Control and Optimal Taxation: A Static Analysis,
W75-10359 6E

Derived Decision Rules for Pollution Control in a General Equilibrium Space Economy,
W75-10360 6C

POLYCHLORINATED BIPHENYLS

Uptake of Three Polychlorinated Biphenyls, DDT and DDE by the Green Sunfish, Lepomis Cyanellus Raf.,
W75-10422 5C

Residues of Polychlorinated Biphenyls (PCB) and Chlorinated Pesticides in Fish and Birds of the Po Delta, (Residus de Polychlorobiphenyls (PCB) et de Pesticides Chlores Dans Les Poissons et Les Oiseaux du Delta du Po),
W75-10446 5B

PCBS in the Spotted Sharks, Mustelus Manazo, From Tokyo Bay, (In Japanese),
W75-10622 5A

POLYCHLORINATED BIPHYENLS

On the Accumulation of Organochlorine Pesticides, PCB and Certain Heavy Metals in Fish and Shellfish from Thai Coastal and Inland Waters,
W75-10616 5B

PONDEROSA PINE ZONE

Watershed Management Problems and Opportunities for the Colorado Front Range Ponderosa Pine Zone: The Status of Our Knowledge,
W75-10655 4D

POROUS MEDIA

A Theory of the Mass Transport of Previously Distributed Chemicals in a Water-Saturated Sorbing Porous Medium: 4. Distributions,
W75-10632 5B

PORT AUTHORITY OF NEW YORK

Environmental Action at Port Authority Airports,
W75-10748 5G

POTABLE WATER

Safe Drinking Water Has Become a Federal Case.
W75-10469 5G

POTASSIUM

The Effect of Heavy Metals on Photosynthesis and Loss of Cell Potassium in Two Species of Marine Algae, Dunaliella tertiolecta and Phaeodactylum tricornutum,
W75-10447 5C

Responses of 'Bearss' Lemon to Nitrogen, Potassium and Irrigation Applications,
W75-10714 3F

PRE-TREATMENT (WATER)

Use of Organic Flocculants for Textile Plant Water Treatment (Pouziti organickych flokulantu k cireni vody pro technologii textilni vyroby),
W75-10383 5F

PRECIPITATION

A Climatological Analysis of North Polar Desert Areas,
W75-10455 2C

PRECIPITATION (ATMOSPHERIC)

A Precipitation Data Simulator Using a Second Order Autoregressive Scheme,
W75-10513 2B

Statistical Model of Short-Duration Precipitation Events,
W75-10529 2B

Priority Problems for Modifying Cumulus Precipitation,
W75-10774 3B

Effectiveness of Precipitation in a Mountain Meadow,
W75-10799 2D

PRESSURE

Snow Creep: Its Engineering Problems and Some Techniques and Results of Its Investigation,
W75-10503 2C

Results of Airblast Overpressure Measurement Program at Project R.D. Bailey,
W75-10555 8H

PRICES

On the Peak-Load Pricing of Urban Water Supply,
W75-10706 6C

PRICING

Water Rates: An Assessment of Current Issues,
W75-10707 6C

PRIMARY PRODUCTIVITY

Herbicides in Aquatic Systems,
W75-10625 5C

The Effect of the Quantity of Silt to the Attached Microorganisms of the Kuzuryu-Gawa River in the Hokuriku District, (In Japanese),
W75010696 5C

PROBABILITY

On the Joint Distribution of the Periods and Amplitudes of Sea Waves,
W75-10534 2L

PROJECTS

Towards a Sharper Concept of an Action Variable,
W75-10813 6A

PROPERTY VALUES

The Effect of Landowner Attitude on the Financial and the Economic Costs of Acquiring Land for a Large Public Works Project,
W75-10827 6B

PROTEIN

Production of Microbial Protein From Waste Cellulose by Thermomonospora Fusca, A Thermophilic Actinomycete,
W75-10538 5C

Protein Content of Winter Wheat Grain as Related to Soil and Climatic Factors in the Semi-Arid Central Great Plains,
W75-10792 3F

PROTEINS

Copper, Zinc and Total Protein Levels in the Plasma of Sockeye Salmon (Oncorhynchus Nerka) During Their Spawning Migration,
W75-10613 5C

PROTOZOA

Response of Freshwater Protozoan Artificial Communities to Metals,
W75-10440 5C

Population Dynamics of Protozoa in Wastewater, and Impact of Environmental Changes,
W75-10689 5D

PUBLIC HEALTH

Safe Drinking Water Has Become a Federal Case.
W75-10469 5G

Health Implications of Exposure to Trace Metals from Combustion of Waste Oil,
W75-10765 5C

Sensitivity of Human Diploid Embryonic Lung Cells from Isolation of Echo Viruses from Sewage,
W75-10836 5C

PUBLIC INVOLVEMENT
Role of the Public in Weather Modification,
W75-10777 3B

PUBLICATIONS
Process Design Manual for Upgrading Existing Waste Water Treatment Plants.
W75-10396 5D

PULP AND PAPER INDUSTRY
Study of Solid Waste Management Practices in the Pulp and Paper Industry.
W75-10366 5D

Reduction of Effluent Pollution at the Arkhangel'sk Mills (Snizhenie zagryaznennosti stochnykh vod na Arkhangel'-skom Kombinate),
W75-10368 5D

Instruction for Record Keeping of Water Consumption at the Enterprises of the Paper Industry (Instruktsiya ucheta raskhoda vody na predpriyatiyakh otrasli),
W75-10370 3E

Wisconsin Tissue Mills One Year After Startup of the Effluent Plant,
W75-10378 5D

Industrial Wastes: Paper and Allied Products,
W75-10397 5D

Problems Encountered in Sludge Treatment and Some Advanced Solutions,
W75-10398 5E

Water Reuse in a Paper Reprocessing Plant,
W75-10401 5D

PULP WASTES
Study of Solid Waste Management Practices in the Pulp and Paper Industry.
W75-10366 5D

Utilization of a Kraft Effluent Channel by Fish and Aquatic Organisms,
W75-10377 5C

Wisconsin Tissue Mills One Year After Startup of the Effluent Plant,
W75-10378 5D

Effect of Temperature and Sludge Loading on 5-Day BOD Removal and Sludge Settleability in Activated Sludge Systems Treating Bleached Kraft Effluents,
W75-10379 5D

Taio Paper (Company, Iyomishima, Japan) Expands to 1,000,000 Tons/Year,
W75-10380 5D

Analytic Characterization of Sewer Loading by Spent Liquors of the Pulp Industry (Analytische Kennzeichung der Belastung der Vorfluter durch Ablaugen der Zellstoffindustrie),
W75-10381 5D

Studies on Possibilities of Biochemical Purification of Evaporator Condensate Occurring During Sulfite Pulp Manufacture (Untersuchungen ueber die Moeglichkeit der biochemischen Reinigung des bei der Sulfitzellstoffherstellung anfallenden Eindampfkondensates),
W75-10382 5D

Swimming Performance of Juvenile Coho Salmon (Oncorhynchus Kisutch) Exposed to Bleached Kraft Pulp Mill Effluent,
W75-10387 5C

Serpaflo: Original Solution to Cleaning Paper Mill Effluents (Serpaflo; La solution originale d'epuration des eaux papeteries),
W75-10389 5D

Rotating Biological Disk Treatment of Kraft Mill Effluents,
W75-10390 5D

Color of Pulp Industry Waste Liquors. (6). Behavior of Color During Waste Treatments (In Japanese),
W75-10393 5D

Color of Pulp Industry Waste Liquors. (7). Color Reduction by Ultraviolet Treatment (In Japanese),
W75-10394 5D

Industrial Wastes: Paper and Allied Products,
W75-10397 5D

Color Removal From Bleached Kraft Effluents,
W75-10399 5D

Analysis of Alternatives for Removal of Suspended Solids in Pulp and Paper Mill Effluents,
W75-10400 5D

Organic Compounds in Pulp Mill Lagoon Discharge,
W75-10402 5D

Toxicity of Pulping Wastes to Fish,
W75-10403 5C

PYRETHRINS
Toxicity of Two Synthetic Pyrethrins to Brown Trout,
W75-10438 5C

PYRETHROIDS (SYNTHETIC)
Biological Activity of Organophosphorus Compounds and Synthetic Pyrethroids Against Immature Mosquitoes,
W75-10631 5G

RADIATION
Laboratory Measurement of Surface Temperature Fluctuations Induced by Small Amplitude Surface Waves,
W75-10505 2L

Error Analysis of Dobson Spectrophotometer Measurements of the Total Atmospheric Ozone Content,
W75-10545 7B

RADIOISOTOPES
Electron Microscope Autoradiography of Kidney After Administration of PB-210 in Mice,
W75-10476 5A

RAILROADS
Re-Refined Diesel Locomotive Lubricating Oil,
W75-10761 5D

RAINBOW TROUT
Effect of a Mixture of Succinic Acid Mono-Sulpho-Ester and Olefin Sulfonate on Fish (Uber die Wirkung einer Mischung von Sulfobernsteinsaure-halbester und Olefinsulfonat auf Fische),
W75-10409 5C

Acute Toxicity of Kanamycin to Steelhead Trout (Salmo Gairdneri),
W75-10423 5C

Toxic Effects of an Anionic Detergent on the Gills of Rainbow Trout,
W75-10434 5C

Toxicity of Paired Mixtures of Candidate Forest Insecticides to Rainbow Trout,
W75-10439 5C

Effect of Water Hardness on the Toxicity of a Nonionic Detergent to Fish,
W75-10444 5C

Acute Toxicity of Ammonia to Several Developmental, Stages of Rainbow Trout, Salmo Gairdneri,
W75-10619 5C

Effects of Temperature on Development and Survival of Rainbow Trout, Salmo Gairdneri, in Acid Waters,
W75-10623 5C

The Effect of Sublethal Concentrations of Copper and Zinc on Ventilatory Activity, Blood Oxygen, and pH in Rainbow Trout (Salmo Gairdneri),
W75-10624 5C

RAINFALL
Cross Spectra of Short-Duration Rainfall,
W75-10514 2B

Hourly Rainfall Generation for a Network,
W75-10515 2B

Stochastic Generation of the Occurrence, Pattern, and Location of Maximum Amount of Daily Rainfall,
W75-10516 2B

Comments on the Statistical Distribution of Rainfall per Period Under Various Transformations,
W75-10517 2B

A Stochastic Model for Daily Rainfall Data Synthesis,
W75-10518 2B

Stochastic Models of Spatial and Temporal Distribution of Thunderstorm Rainfall,
W75-10519 2B

Stochastic Model of Daily Rainfall,
W75-10520 2B

An Event-Based Stochastic Model of Areal Rainfall and Runoff,
W75-10521 2B

Statistical Model of Short-Duration Precipitation Events,
W75-10529 2B

Water Collection and Storage Dispersion Apparatus,
W75-10727 4A

Sediment-Yield Characteristics from Unit Source Watersheds,
W75-10848 2J

RAINFALL DISPOSITION
A Precipitation Data Simulator Using a Second Order Autoregressive Scheme,
W75-10513 2B

RAINFALL-RUNOFF RELATIONSHIPS
Determine Urban Runoff the Simple Way,
W75-10716 2E

RANGE MANAGEMENT
Watershed Management Problems and Opportunities for the Colorado Front Range Ponderosa Pine Zone: The Status of Our Knowledge,
W75-10655 4D

RATIONAL FORMULA
Determine Urban Runoff the Simple Way,
W75-10716 2E

RE-REFINING
Quality Products from Used Petroleum Oils,
W75-10756 5D

The Economics of Re-Refining,
W75-10757 5G

Experience with the IFP Propane Clarification Process in Re-Refining Spent Crankcase Oils,
W75-10759 5D

Re-Refined Diesel Locomotive Lubricating Oil,
W75-10761 5D

Massachusetts Waste Oil Management Activities,
W75-10763 5D

RECLAIMED WATER
Waste Water Treatment: Water Reclamation and Reuse,
W75-10372 5D

Water Supply from Renovated Wastewater--A Resource Manual for Massachusetts Planners, Public Officials and Citizen Groups.
W75-10722 5D

RECREATION
A Connectives Model Relating Water Policy Action Variables to Recreational Opportunity Social Indicators,
W75-10819 6A

Derivation of Reservoir Operating Rules by Economic Analysis,
W75-10825 4A

RECREATION DEMAND
Analysis of Reservoir Recreation Benefits,
W75-10826 6B

RECREATION FACILITIES
Valley Design in Urban Growth Centres,
W75-10643 6B

RECYCLING
Problems of Space Biology. Volume 24. The Water Supply of Spacecraft Crews,
W75-10365 5D

Reclamation of Textile Printing Wastewaters for Direct Recycle,
W75-10676 5D

Closed Recycling System for Water Purification and Waste Reduction,
W75-10735 5D

Multiple Cycle Process for Wastewater Purification,
W75-10738 5D

Proceedings of the International Conference on Waste Oil Recovery and Reuse.
W75-10739 5D

Containment, Collection and Recycling of Oily Wastes,
W75-10747 5G

Disposal and/or Recycle of Air Force Waste Petroleum Oils and Lubricants,
W75-10749 5D

Quality Products from Used Petroleum Oils,
W75-10756 5D

The Economics of Re-Refining,
W75-10757 5G

Experience with the IFP Propane Clarification Process in Re-Refining Spent Crankcase Oils,
W75-10759 5D

Oil Contaminated Water Recycling System,
W75-10760 5D

Re-Refined Diesel Locomotive Lubricating Oil,
W75-10761 5D

Rate of Phosphorus Uptake by Activated Sludge,
W75-10839 5D

REDUCTION (CHEMICAL)
Arsenate Uptake and Reduction by Pocillopora verrucosa,
W75-10491 5C

REFACTORY INDEX
An Evaluation of Persistency for Water Borne Organics,
W75-10850 5B

REGIONAL ANALYSIS
Summary Appraisals of the Nation's Ground-Water Resources--Rio Grande Region,
W75-10597 4B

Summary Appraisals of the Nation's Ground-Water Resources--Ohio Region,
W75-10598 4B

The Master Plan for Water-Supply in the Regional Municipality of Ottawa-Carleton,
W75-10710 3D

REGIONAL DEVELOPMENT
Principles and standards for Water Planning,
W75-10355 6B

Rivers in the City,
W75-10723 6B

REGRESSION ANALYSIS
General Aspects of Multivariate Analysis with Applications to Some Problems in Hydrology,
W75-10510 2A

Use of Autoregressive Runoff Models in Reservoir Studies,
W75-10523 2E

Analysis of Reservoir Recreation Benefits,
W75-10826 6B

REHABILITATION
Automation of an Existing Irrigation System - Part I,
W75-10788 8C

REMOTE SENSING
A Remote Sensing Laser Fluorometer,
W75-10831 5A

REND LAKE DAM (ILL)
Turbulent Flow in Rectangular Outlet Conduit, Rend Lake Dam, Big Muddy River, Illinois,
W75-10666 8B

REPRODUCTION
Toxic Effects of Aliphatic Chlorinated by-Products from Vinyl Chloride Production on Marine Animals,
W75-10412 5C

Some Observations on Spawning of Brook Trout (Salvelinus Fontinalis Mitchill) in Lime Neutralized Iron Hydroxide Suspensions,
W75-10445 5C

Toxicity and Residue Dynamics of the Lampricide 3-Trifluoro-Methyl-4-Nitrophenol (TFM) in Aquatic Invertebrates,
W75-10700 5C

REPUBLICAN RIVER (NEB)
Groundwater Model as a Tool in Planning and Management,
W75-10781 4B

RESEARCH AND DEVELOPMENT
Progress in Australian Hydrology 1965-1974.
W75-10646 2A

Current Water Systems Automation Research and Development in the Bureau of Reclamation,
W75-10787 8C

RESERVOIR CONSTRUCTION
Harry S. Truman Dam and Reservoir, Osage River, Missouri, Apendix A (Final Environmental Impact Statement).
W75-10363 8A

RESERVOIR OPERATION
Derivation of Reservoir Operating Rules by Economic Analysis,
W75-10825 4A

RESERVOIR STORAGE
Some Problems in Pure and Applied Stochastic Hydrology,
W75-10508 2A

RESERVOIRS
Use of Autoregressive Runoff Models in Reservoir Studies,
W75-10523 2E

Problems Related to Water Quality and Algal Control in Lopez Reservoir, San Luis Obispo County, California,
W75-10601 5B

A Numerical Model for Predicting the Effects of Landslide-Generated Water Waves,
W75-10661 8A

RESINS
Problems of Space Biology. Volume 24. The Water Supply of Spacecraft Crews,
W75-10365 5D

RESOURCES
Review of Development of Arctic Resources,
W75-10462 2C

RESOURCES ALLOCATION
Review of Development of Arctic Resources,
W75-10462 2C

RESOURCES DEVELOPMENT
Review of Development of Arctic Resources,
W75-10462 2C

Resource Development in Canada's High Arctic,
W75-10463 2C

RESPIRATION
The Effect of Different Salinities and Manganese Ion on the Survival Respiration of the Baltic Flounder (Pleuronectes Flesus Trachurus (Dunker)) of the Gulf of Riga,
W75-10411 5C

Effect of the Insecticide Zectran (Mexacarbate) on Several Algae,
W75-10425 5C

The Effect of Sublethal Concentrations of Copper and Zinc on Ventilatory Activity, Blood Oxygen, and pH in Rainbow Trout (Salmo Gairdneri),
W75-10624 5C

RETURN PERIODS
Recurrence Intervals of Annual Minimum Streamflows,
W75-10530 2E

REVERSE OSMOSIS
How to Purify Effluents, Recover Byproducts With Reverse Osmosis,
W75-10391 5F

REVIEWS
Activated Sludge,
W75-10371 5D

Waste Water Treatment: Water Reclamation and Reuse,
W75-10372 5D

Waste Water Treatment: Land Disposal of Waste Water,
W75-10373 5E

Waste Water Treatment: Lagoons and Oxidation Ponds,
W75-10374 5D

Waste Water Treatment: Sludge Treatment, Utilization, and Disposal,
W75-10395 5D

Industrial Wastes: Paper and Allied Products,
W75-10397 5D

Watershed Management in the Rocky Mountain Subalpine Zone: The Status of Our Knowledge,
W75-10405 3B

Progress in Australian Hydrology 1965-1974.
W75-10646 2A

Avalanche Protection in Switzerland.
W75-10656 8C

RICE
Phosphorus Availability of Some Philippine Rice Soils as Affected by Soil and Water Management Practices,
W75-10421 3F

RIO GRANDE REGION
Summary Appraisals of the Nation's Ground-Water Resources--Rio Grande Region,
W75-10597 4B

RIO GRANDE RIVER
Summary Appraisals of the Nation's Ground-Water Resources--Rio Grande Region,
W75-10597 4B

Economic Impact of the Conversion of Water from Irrigation to Municipal and Industrial Use in the Rio Grande Basin of New Mexico,
W75-10771 6D

Effect of Agricultural Use on Water Quality for Downstream Use for Irrigation,
W75-10805 5G

RIVER BASINS
A River-Quality Assessment of the Upper White River, Indiana,
W75-10600 5B

RIVER REGULATION
Toward an Ice-Free Arctic Ocean,
W75-10532 2C

RIVERS
Multisite Streamflow Simulation of Truckee River, Nevada,
W75-10509 2E

Competence of Rivers to Transport Coarse Bedload Material,
W75-10540 2J

Hydraulics and Mechanics of River Ice Jams,
W75-10556 8B

Trace Elements in Melbourne Rivers - An Interlaboratory Analysis,
W75-10649 5A

Rivers in the City,
W75-10723 6B

Problems of Water Quality Management in Western River Basin Systems,
W75-10804 5G

Water Analysis of River Waters in Kagawa (IX), Chemical Composition of the Aya Water Basin, (In Japanese),
W75-10841 2K

ROCK EXCAVATION
Project Lost Creek: Field Tests of Mounding and Controlled Blasting,
W75-10553 8H

ROCKS
Atomic Absorption Spectrometric Determination of Cadmium, Lead, Silver, Thallium and Zinc in Silicate Rocks by Direct Atomization From the Solid State,
W75-10492 2K

Determination of Nickel in Rocks After Epithermal Neutron Activation,
W75-10493 2K

Uranium, Thorium, and Lead Concentrations in Three Silicate Standards and a Method of Lead Isotopic Analysis,
W75-10494 2K

ROCKY MOUNTAIN REGION
Watershed Management in the Rocky Mountain Subalpine Zone: The Status of Our Knowledge,
W75-10405 3B

ROCKY MOUNTAIN TRENCH (BRITISH COLUMBIA)
Glacier-Flow Patterns and the Origin of Late Wisconsinan Till in the Southern Rocky Mountain Trench, British Columbia,
W75-10539 2C

RODENTS
Electron Microscope Autoradiography of Kidney After Administration of PB-210 in Mice,
W75-10476 5A

Persistence of Cadmium-Induced Metabolic Changes in Liver and Kidney,
W75-10478 5A

ROOT SYSTEMS
Flooding and Soil Temperature Effects on Wheat During Grain Filling,
W75-10829 3F

ROTATING BIOLOGICAL CONTACTOR
Treatment of Winery Wastes by Aerated Lagoon, Activated Sludge, and Rotating Biological Contractor,
W75-10685 5D

ROTATING BIOLOGICAL DISK
Rotating Biological Disk Treatment of Kraft Mill Effluents,
W75-10390 5D

ROUTING
Nonlinear Channel Routing by Computer,
W75-10543 4A

RUNOFF
A Climatological Analysis of North Polar Desert Areas,
W75-10455 2C

Some Problems in Pure and Applied Stochastic Hydrology,
W75-10508 2A

An Event-Based Stochastic Model of Areal Rainfall and Runoff,
W75-10521 2B

Use of Autoregressive Runoff Models in Reservoir Studies,
W75-10523 2E

The Effects of Urbanization on Floods of Different Recurrence Interval,
W75-10709 4C

Sediment-Yield Characteristics from Unit Source Watersheds,
W75-10848 2J

RUNOFF FORECASTING
Determine Urban Runoff the Simple Way,
W75-10716 2E

RURAL AREAS
Runoff of Oils from Rural Roads Treated to Suppress Dust,
W75-10766 5B

Principles of Establishing Sewer Systems in the Rural Settlements of Magdeburg County (Grundlagen fuer die Abwasser-Technische Erschliessung von Landgemeinden im Bezirk Magdeburg),
W75-10833 5D

SABIN RIVER (TEX)
Developing Regional Stochastic Data Bases,
W75-10528 2E

SACRAMENTO COUNTY
Evaluation of Ground Water Resources: Sacramento County,
W75-10546 2F

SAFE DRINKING WATER ACT
Safe Drinking Water Has Become a Federal Case.
W75-10469 5G

SAFETY FACTORS
Snow Avalanche Sites: Their Identification and Evaluation,
W75-10659 2C

SALINE SOILS
Drainage Analysis of a Confining Formation,
W75-10780 4A

SALINE WATER FISH
PCBS in the Spotted Sharks, Mustelus Manazo, From Tokyo Bay, (In Japanese),
W75-10622 5A

SALINE WATER INTRUSION
The Loxahatchee - A River in Distress, Southeast Florida,
W75-10588 4C

SALINITY
The Effect of Different Salinities and Manganese Ion on the Survival Respiration of the Baltic Flounder (Pleuronectes Flesus Trachurus (Dunker)) of the Gulf of Riga,
W75-10411 5C

Decrease of Net Carbon Flux in Two Species of Mussels Caused by Extracts of Crude Oil,
W75-10433 5C

The Effect of Temperature and Salinity on Cadmium Uptake by the Blue Crab, Callinectes sapidus,
W75-10448 5C

Daily Temperature and Salinity of Surface Water of Patuxent River at Solomons, Maryland, Based on 30 Years of Records (1938-1967),
W75-10535 2E

Norton Point Dike Study, Coney Island, New York; Hydraulic Model Investigation,
W75-10662 8B

Combined Effects of Cadmium and Salinity on Development and Survival of Herring Eggs,
W75-10704 5C

Problems of Water Quality Management in Western River Basin Systems,
W75-10804 5G

Effect of Agricultural Use on Water Quality for Downstream Use for Irrigation,
W75-10805 5G

SALMON
Swimming Performance of Juvenile Coho Salmon (Oncorhynchus Kisutch) Exposed to Bleached Kraft Pulp Mill Effluent,
W75-10387 5C

Effects of Acute Exposure to Bleached Kraft Pulp Mill Effluent on Carbohydrate Metabolism of Juvenile Coho Salmon (Oncorhynchus Kisutch) During Rest and Exercise,
W75-10388 5C

Aspects of the Winter Ecology of Juvenile Coho Salmon (Oncorhynchus Kisutch) and Steelhead Trout (Salmo Gairdneri),
W75-10615 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) To Nontarget Fish in Flow- Through Tests,
W75-10702 5C

SALMONIDS
Effect of a Mixture of Succinic Acid Mono-Sulpho-Ester and Olefin Sulfonate on Fish (Uber die Wirkung einer Mischung von Sulfobernsteinsaure-halbester und Olefinsulfonat auf Fische),
W75-10409 5C

Corticosteroid Concentrations in Sockeye Salmon (Oncorhynchus Nerka) Exposed to Low Concentrations of Copper,
W75-10415 5C

Acute Toxicity of Kanamycin to Steelhead Trout (Salmo Gairdneri),
W75-10423 5C

Temperature-Induced Changes in Acute Toxicity of Zinc to Atlantic Salmon (Salmo salar),
W75-10431 5C

Toxic Effects of an Anionic Detergent on the Gills of Rainbow Trout,
W75-10434 5C

Water Quality Criteria for European Fresh-Water Fish.
W75-10609 5C

Aspects of the Winter Ecology of Juvenile Coho Salmon (Oncorhynchus Kisutch) and Steelhead Trout (Salmo Gairdneri),
W75-10615 5C

Acute Toxicity of Ammonia to Several Developmental, Stages of Rainbow Trout, Salmo Gairdneri,
W75-10619 5C

Toxaphene Effects on Growth and Development of Brook Trout (Salvelinus Fontinalis),
W75-10621 5C

Effects of Temperature on Development and Survival of Rainbow Trout, Salmo Gairdneri, in Acid Waters,
W75-10623 5C

The Effect of Sublethal Concentrations of Copper and Zinc on Ventilatory Activity, Blood Oxygen, and pH in Rainbow Trout (Salmo Gairdneri),
W75-10624 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) to the Nontarget Fish in Static Tests,
W75-10701 5C

SALT TOLERANCE
Irrigation Management for Salt Control,
W75-10800 3C

SALTS
Irrigation Management for Salt Control,
W75-10800 3C

SAMPLING
Enrichment of Surface Freshwater Microlayers with Algae,
W75-10583 5A

The Effect of the Quantity of Silt to the Attached Microorganisms of the Kuzuryu-Gawa River in the Hokuriku District, (In Japanese),
W75010696 5C

SAN LUIS VALLEY
Wellton-Mohawk Drainage and the Mexican Salt Problem,
W75-10783 4A

SANGAMON RIVER (ILL)
Flood Plain Information: Macon County, Illinois.
W75-10565 4A

SANTA ANA RIVER (CAL)
Flood Control Project on Lytle and Warm Creeks and Santa Ana River, California; Hydraulic Model Investigation,
W75-10668 8B

SARDINE
The Concentration of Mercury, Copper, Nickel, Silver, Cadmium and Lead in the Northern Adriatic Anchovy, Engraulis Encrasicholus, and Sardine, Sardina Pilchardus,
W75-10620 5B

SAVEALLS
Increasing the Efficiency of Flotation Savealls (Povyshenie effektivnosti raboty flotatsionnykh lovushek),
W75-10369 5D

SCREENS
Marine Floating Screen.
W75-10634 5G

SEA ICE
Toward an Ice-Free Arctic Ocean,
W75-10532 2C

Floating Glacial Ice Caps in the Arctic Ocean,
W75-10533 2C

SEA URCHIN EGGS
Marine Pollution Bioassay by Sea Urchin Eggs, An Attempt to Enhance Accuracy,
W75-10419 5A

Bioassay Data for Marine Pollution Using Sea Urchin Eggs, 1972 and 1973,
W75-10432 5A

SEA WATER
Marine Pollution Bioassay by Sea Urchin Eggs, An Attempt to Enhance Accuracy,
W75-10419 5A

Bioassay Data for Marine Pollution Using Sea Urchin Eggs, 1972 and 1973,
W75-10432 5A

The Effects of a No. 2 Fuel Oil and Two Crude Oils on the Growth and Photosynthesis of Microalgae,
W75-10436 5C

Arsenate Uptake and Reduction by Pocillopora verrucosa,
W75-10491 5C

SEABOOMS
Marine Floating Screen.
W75-10634 5G

SEATTLE-TACOMA AREA (WASH)
Flood Hazards in the Seattle-Tacoma Urban Complex and Adjacent Areas, Washington,
W75-10580 7C

SECONDARY PRODUCTIVITY
Herbicides in Aquatic Systems,
W75-10625 5C

SECONDARY UNDULATIONS
Some Features of Tsunamis on the Pacific Coast of South and North America,
W75-10554 2L

SEDIMENT CONTROL
Evaluation of Disposal Areas in James River; Hydraulic Model Investigation,
W75-10669 8B

SEDIMENT DISCHARGE
Total Sediment Load by the Extrapolated Data Procedure,
W75-10847 2J

SEDIMENT DISTRIBUTION
Sediment Characteristics of Streams in the Eastern Piedmont and Western Coastal Plain Regions of North Carolina,
W75-10586 2J

SEDIMENT LOAD
Flood Waves and Suspended Sediment Pulses in Urbanized Catchments,
W75-10647 4C

SEDIMENT LOAD

Total Sediment Load by the Extrapolated Data Procedure,
W75-10847 2J

SEDIMENT MEASUREMENT
Total Sediment Load by the Extrapolated Data Procedure,
W75-10847 2J

SEDIMENT MODELS
Total Sediment Load by the Extrapolated Data Procedure,
W75-10847 2J

SEDIMENT TRANSPORT
Research in Stochastic Models for Bedload Transport,
W75-10522 2J

Dispersion of Contaminated Bedload Particles,
W75-10526 5B

Competence of Rivers to Transport Coarse Bedload Material,
W75-10540 2J

Sediment Characteristics of Streams in the Eastern Piedmont and Western Coastal Plain Regions of North Carolina,
W75-10586 2J

Total Sediment Load by the Extrapolated Data Procedure,
W75-10847 2J

SEDIMENT YIELD
A Stochastic Model of Sediment Yield for Ephemeral Streams,
W75-10524 2J

Sediment Characteristics of Streams in the Eastern Piedmont and Western Coastal Plain Regions of North Carolina,
W75-10586 2J

Sediment-Yield Characteristics from Unit Source Watersheds,
W75-10848 2J

SEEPAGE
Seepage from Recharge and Landfill Ditches,
W75-10770 5B

SELENIUM
Effect of Dietary Selenium on Glutathione Peroxidase in the Chick,
W75-10495 5A

SEMIARID CLIMATES
Some Aspects of Climatology in Polar Barrens,
W75-10454 2C

SENECA CREEK (MD)
Flood Plain Information Report: Seneca Creek, Montgomery County, Maryland.
W75-10567 4A

SEPARATED SEWERS
Coping With Urban Runoff in the United States,
W75-10541 5D

SEPARATION TECHNIQUES
Feasibility Test Program of Application of Coalescing Phase Oil/Water Separators to Self Compensating Fuel Tanks in Surface Ships,
W75-10474 5G

Fast Separation of Tin (IV) From Tin (II) and From Numerous Metal Ions on Ion-Exchange Papers,
W75-10497 2K

Recovering Oil Spills from Water.
W75-10635 5G

Reclamation of Textile Printing Wastewaters for Direct Recycle,
W75-10676 5D

Oil and Debris Removal Unit,
W75-10726 5G

Oil Separation and Recovery Device,
W75-10728 5G

Air and Water Pollution Control,
W75-10732 5D

Closed Recycling System for Water Purification and Waste Reduction,
W75-10735 5D

SERPAFLO
Serpaflo: Original Solution to Cleaning Paper Mill Effluents (Serpaflo; La solution originale d'epuration des eaux papeteries),
W75-10389 5D

SERUM
Physiological Changes in the Serum and Hepatopancreas of Yellow Tail Injected with Carbon Tetrachloride, (In Japanese),
W75-10630 5C

SERVICE WATER
Treatment of Service Water with Ozone,
W75-10840 5D

SESSILE ALGAE
The Effect of the Quantity of Silt to the Attached Microorganisms of the Kuzuryu-Gawa River in the Hokuriku District, (In Japanese),
W75010696 5C

SEVIER RIVER (UTAH)
Effect of Agricultural Use on Water Quality for Downstream Use for Irrigation,
W75-10805 5G

SEVIN
Effects of the Insecticide Sevin and Its First Hydrolytic Product, 1-Napthol, on Some Early Developmental Stages of the Bay Mussel, Mytilus edulis,
W75-10435 5C

SEWAGE
Sensitivity of Human Diploid Embryonic Lung Cells from Isolation of Echo Viruses from Sewage,
W75-10836 5C

SEWAGE EFFLUENTS
Art of Agricultural Drainage Design and Costs,
W75-10797 4A

Utilization of Sewage Effluent for Irrigation,
W75-10798 5D

SEWAGE SLUDGE
Heat Treatment of Sewage Sludges,
W75-10644 5D

Investigations on the Production of Hygienic Compost from Air-Dried Sewage Using Different Additives (Versuche zur Herstellung von hygienisch einwandfreiem Kompost aus luftgetrocknetem Faulschlamm unter Verwendung verschiedener Zusaetze),
W75-10834 5D

SEWAGE TREATMENT
Corrosion and Its Cost in Sewage Treatment,
W75-10364 8G

Toxicity of Chlorinated Municipal Wastes to Fish: An Evaluation Based on Michigan Field Data,
W75-10680 5C

Vacuum Filtration Cost Optimization,
W75-10681 5D

Population Dynamics of Protozoa in Wastewater, and Impact of Environmental Changes,
W75-10689 5D

Domestic Waste Water Reuse--Aspects of the Treatment System,
W75-10708 5D

Water and Wastewater Facilities for Florida Housing Developments,
W75-10717 5D

Stockholm Puts Sewage Plants Underground,
W75-10718 5D

Integral Circular Wastewater Treatment Plant,
W75-10729 5D

Multiple Cycle Process for Wastewater Purification,
W75-10738 5D

The Toxicity of Heavy Metal Ions to Anaerobic Digestion,
W75-10843 5D

SEWERAGE
Principles of Establishing Sewer Systems in the Rural Settlements of Magdeburg County (Grundlagen fuer die Abwasser-Technische Erschliessung von Landgemeinden im Bezirk Magdeburg),
W75-10833 5D

SHABAKUNK CREEK (NJ)
Flood Plain Information: Shabakunk Creek, West Branch Shabakunk and Little Shabakunk Creeks, Mercer County, New Jersey.
W75-10572 4A

SHARKS
PCBS in the Spotted Sharks, Mustelus Manazo, From Tokyo Bay, (In Japanese),
W75-10622 5A

SHEAR STRENGTH
Large Scale Laboratory Direct Shear Tests on Ice,
W75-10502 2C

SHIPS
Oily Bilge from Commercial Vessels,
W75-10752 5B

Shipyard Problems with Oily Wastes,
W75-10753 5B

SHIPYARDS
Shipyard Problems with Oily Wastes,
W75-10753 5B

SHRIMP
Toxic Effects of Aliphatic Chlorinated by-Products from Vinyl Chloride Production on Marine Animals,
W75-10412 5C

SIERRE LEONE
Tar Pollution of Sierra Leone Beaches,
W75-10472 5B

SILICATES
Uranium, Thorium, and Lead Concentrations in Three Silicate Standards and a Method of Lead Isotopic Analysis,
W75-10494 2K

SILTS
The Effect of the Quantity of Silt to the Attached Microorganisms of the Kuzuryu-Gawa River in the Hokuriku District, (In Japanese),
W75010696 5C

SILVER
The Concentration of Mercury, Copper, Nickel, Silver, Cadmium and Lead in the Northern Adriatic Anchovy, Engraulis Encrasicholus, and Sardine, Sardina Pilchardus,
W75-10620 5B

SIMULATION ANALYSIS
Land Use Simulation Model of the Subalpine Coniferous Forest Zone,
W75-10404 3B

Multisite Streamflow Simulation of Truckee River, Nevada,
W75-10509 2E

A Precipitation Data Simulator Using a Second Order Autoregressive Scheme,
W75-10513 2B

Developing Regional Stochastic Data Bases,
W75-10528 2E

Algorithmic Modeling and the Straw Man,
W75-10820 6A

Optimal Sizing of Urban Flood-Control Systems,
W75-10821 4A

Computer Simulation of Water Distribution Networks,
W75-10823 4A

SIOUX FALLS (SD)
Deterioration of Water Quality in Distribution Systems,
W75-10711 5F

SLUDGE DISPOSAL
Waste Water Treatment: Sludge Treatment, Utilization, and Disposal,
W75-10395 5D

Problems Encountered in Sludge Treatment and Some Advanced Solutions,
W75-10398 5E

Process Design Manual for Sludge Treatment and Disposal.
W75-10475 5D

Guidelines for Landfill of Toxic Industrial Sludges,
W75-10487 5G

Sludge Disposal on Agricultural Soil,
W75-10674 5D

Disposal of Digested Sewage Sludge by Landfill,
W75-10682 5D

SLUDGE TREATMENT
Waste Water Treatment: Sludge Treatment, Utilization, and Disposal,
W75-10395 5D

Problems Encountered in Sludge Treatment and Some Advanced Solutions,
W75-10398 5E

Process Design Manual for Sludge Treatment and Disposal.
W75-10475 5D

Gravity Dewatering of Metal Hydroxide Sludges,
W75-10500 5D

Heat Treatment of Sewage Sludges,
W75-10644 5D

Vacuum Filtration Cost Optimization,
W75-10681 5D

SLUDGE WASTES
Guidelines for Landfill of Toxic Industrial Sludges,
W75-10487 5G

SLUDGES
Gravity Dewatering of Metal Hydroxide Sludges,
W75-10500 5D

SNAILS
Listeria in Aquatic Animals,
W75-10375 2I

SNOW
Geomorphic Processes in Polar Deserts,
W75-10456 2C

Geological and Limnological Factors of Cold Deserts,
W75-10457 2C

SNOW CREEP
Snow Creep: Its Engineering Problems and Some Techniques and Results of Its Investigation,
W75-10503 2C

SNOW FENCES
New Engineering Criteria for Snow Fence Systems,
W75-10692 2C

New Snow Fence Design Controls Drifts, Improves Visibility, Reduces Road Ice,
W75-10693 2C

SNOW MANAGEMENT
A Weibull Prediction of the Tensile Strength-Volume Relationship of Snow,
W75-10651 2C

Snow Avalanche Sites: Their Identification and Evaluation,
W75-10659 2C

Water-Yield Improvement from Alpine Areas: The Status of Our Knowledge,
W75-10660 3B

New Engineering Criteria for Snow Fence Systems,
W75-10692 2C

New Snow Fence Design Controls Drifts, Improves Visibility, Reduces Road Ice,
W75-10693 2C

Estimating the Transport and Evaporation of Blowing Snow,
W75-10695 2C

SNOWPACKS
Snow Creep: Its Engineering Problems and Some Techniques and Results of Its Investigation,
W75-10503 2C

Water-Yield Improvement from Alpine Areas: The Status of Our Knowledge,
W75-10660 3B

New Engineering Criteria for Snow Fence Systems,
W75-10692 2C

New Snow Fence Design Controls Drifts, Improves Visibility, Reduces Road Ice,
W75-10693 2C

Estimating the Transport and Evaporation of Blowing Snow,
W75-10695 2C

SOCIAL ASPECTS
Panel Review of the Taxonomic Structure of the Straw Man.
W75-10806 6B

Panel Evaluation of the Logical Structure, Consistency, and Underlying Assumptions of the 'Strawman' Methodology.
W75-10807 6B

Report to the Technical Committee of the Water Resources Centers of the Thirteen Western States,
W75-10809 6B

Proceedings of the Graduate Student Symposium of the Technical Committee of the Water Resources Centers of the Thirteen Western States.
W75-10810 6A

Methodological Application of the Straw Man Decision Structure to a Hypothetical Case: The Dorfman-Jacoby Water Quality Model,
W75-10811 6A

Social Indicators and Connectives,
W75-10812 6A

Methodological Problems in Applying the Straw Man to Real Life Problems,
W75-10814 6A

A Method of Disaggregation,
W75-10817 6A

SOCIAL EQUILIBRIUM
Theoretical and Applied Concepts of Water Resources for Social Welfare.
W75-10354 6B

International Production Aspects of Water and Environmental Quality Control,
W75-10357 5G

SOCIAL GOALS
Methodological Application of the Straw Man Decision Structure to a Hypothetical Case: The Dorfman-Jacoby Water Quality Model,
W75-10811 6A

SOCIAL IMPACT
Analyzing Reimbursement Mechanisms for Resource Development Projects,
W75-10353 6C

SOCIAL INDICATORS
Panel Review of the Taxonomic Structure of the Straw Man.
W75-10806 6B

Methodological Application of the Straw Man Decision Structure to a Hypothetical Case: The Dorfman-Jacoby Water Quality Model,
W75-10811 6A

SOCIAL PARTICIPATION
Role of the Public in Weather Modification,
W75-10777 3B

SOCKEYE SALMON
Copper, Zinc and Total Protein Levels in the Plasma of Sockeye Salmon (Oncorhynchus Nerka) During Their Spawning Migration,
W75-10613 5C

SODIUM SULFATE
Absorption, Metabolism, and Excretion by Goldfish of the Anionic Detergent Sodium Lauryl Sulphate,
W75-10626 5C

SOIL ANALYSIS
The Determination of Mercury in Soils and Related Materials by Cold-Vapour Atomic Absorption Spectrometry,
W75-10485 5A

SOIL CLASSIFICATION
Soils of the High Arctic Landscapes,
W75-10458 2C

SOIL DISPOSAL FIELDS
Sludge Disposal on Agricultural Soil,
W75-10674 5D

Land Treatment of Municipal Sewage,
W75-10719 5D

SOIL INVESTIGATIONS
Pedologic Cover of the Watershed of the Porecka River,
W75-10551 2A

SOIL MANAGEMENT
Operational Value of Weather Information in Relation to Soil Management Characteristics,
W75-10367 2G

Phosphorus Availability of Some Philippine Rice Soils as Affected by Soil and Water Management Practices,
W75-10421 3F

SOIL MICROBIOLOGY
Application of Low-Latitude Microbial Ecology to High-Latitude Deserts,
W75-10459 2C

SOIL MOISTURE
Prediction of Trifluralin Diffusion Coefficients,
W75-10542 5B

Effects of Soil Moisture on Stress on 2 Varieties of Upland Cotton in Israel: IV. Effects of Periods of Stress Occurrence, Correlations and Regressions,
W75-10791 3F

SOIL PHYSICAL PROPERTIES
Soils of the High Arctic Landscapes,
W75-10458 2C

SOIL TEMPERATURE
Flooding and Soil Temperature Effects on Wheat During Grain Filling,
W75-10829 3F

SOIL TREATMENT
Land Treatment of Municipal Sewage,
W75-10719 5D

SOIL WATER
Protein Content of Winter Wheat Grain as Related to Soil and Climatic Factors in the Semi-Arid Central Great Plains,
W75-10792 3F

SOIL-WATER-PLANT RELATIONSHIPS
Water-Soil-Plant Interactions with Terbacil,
W75-10486 5C

SOILS
Soils of the High Arctic Landscapes,
W75-10458 2C

Pedologic Cover of the Watershed of the Porecka River,
W75-10551 2A

SOLID WASTES
Study of Solid Waste Management Practices in the Pulp and Paper Industry.
W75-10366 5D

Guidelines for Landfill of Toxic Industrial Sludges,
W75-10487 5G

SORGHUM
Water-Soil-Plant Interactions with Terbacil,
W75-10486 5C

SOUTH AMERICA
Some Features of Tsunamis on the Pacific Coast of South and North America,
W75-10554 2L

SOUTH DAKOTA
Flood Plain Information: Brookings, Brookings County, South Dakota, Volume I - Deer Creek.
W75-10570 4A

Deterioration of Water Quality in Distribution Systems,
W75-10711 5F

Weather Modification for Use in the High Plains,
W75-10775 3B

SOUTHERN UINTA BASIN (UTAH AND COLO)
Hydrologic Reconnaissance of the Southern Uinta Basin, Utah and Colorado,
W75-10585 3B

SOUTHWEST HILLSBOROUGH COUNTY (FLA)
Hydrological Data From Wells in Southwest Hillsborough County, Florida, 1950-74,
W75-10593 7C

SOUTHWEST U.S.
Stochastic Models of Spatial and Temporal Distribution of Thunderstorm Rainfall,
W75-10519 2B

Utilization of Sewage Effluent for Irrigation,
W75-10798 5D

SOUTHWEST US
Some Effects of Field Weathering of Seed Cotton in a Desert Environment,
W75-10557 3F

SPACECRAFT
Problems of Space Biology. Volume 24. The Water Supply of Spacecraft Crews,
W75-10365 5D

SPATIAL DISTRIBUTION
Stochastic Models of Spatial and Temporal Distribution of Thunderstorm Rainfall,
W75-10519 2B

An Investigation of the Ecology and Water Quality of a Lake Outlet,
W75-10724 5C

SPAWNING
Some Observations on Spawning of Brook Trout (Salvelinus Fontinalis Mitchill) in Lime Neutralized Iron Hydroxide Suspensions,
W75-10445 5C

Copper, Zinc and Total Protein Levels in the Plasma of Sockeye Salmon (Oncorhynchus Nerka) During Their Spawning Migration,
W75-10613 5C

SPECTROMETERS
Error Analysis of Dobson Spectrophotometer Measurements of the Total Atmospheric Ozone Content,
W75-10545 7B

SPECTROPHOTOMETRY
Determination of Manganese in Natural Waters by Atomic Absortion Spectrometry with a Carbon Tube Atomizer,
W75-10386 5A

The Determination of Mercury in Soils and Related Materials by Cold-Vapour Atomic Absorption Spectrometry,
W75-10485 5A

Rapid Extractive Spectrophotometric Determination of Gold (III) With 4-(2-Pyridylazo)-Resorcinol,
W75-10499 2K

SPECTROSCOPY
Determination of the Transition Metals Manganese, Iron, Cobalt, Copper and Zinc in River Fishes With Help of X-Ray Fluorescence Analysis and Flameless Atomic Absorption Spectroscopy, (Bestimmung der Ubergangsmetalle Mangan, Eisen, Kobalt, Kupfer und zink in Flussfischen mit Hilfe der Rontgenfluores-zenzanalyse und der flammenlosen Atomabsorption),
W75-10408 5A

Atomic Absorption Spectrometric Determination of Cadmium, Lead, Silver, Thallium and Zinc in Silicate Rocks by Direct Atomization From the Solid State,
W75-10492 2K

SPILLWAYS
Project Lost Creek: Field Tests of Mounding and Controlled Blasting,
W75-10553 8H

Spillway for Burnsville Dam, Little Kanawha River, West Virginia; Hydraulic Model Investigation,
W75-10665 8B

SPOTTED SHARKS
PCBS in the Spotted Sharks, Mustelus Manazo, From Tokyo Bay, (In Japanese),
W75-10622 5A

SPRAYING
Herbicides in Aquatic Systems,
W75-10625 5C

SPRINGFIELD (VT)
Water Works Improvements--Springfield, Vermont,
W75-10713 3D

SPRUCE TREES (PICEA)
Spent Liquor From Peroxide Bleaching of Groundwood Pulp From Spruce,
W75-10392 5A

STABILITY
Fluid-Dynamic Excitation Involving Flow Instability,
W75-10544 8B

STABLE ISOTOPES
Lead Metabolism in the Normal Human: Stable Isotope Studies,
W75-10484 5A

STACK GAS EMISSIONS
Water Pollution Problems Associated with Control of Stack Gas Emission,
W75-10691 5B

STAGE-DISCHARGE RELATIONS
A Model of Statistical Errors in Estimating Streamflow from Continuous-Stage Records,
W75-10512 2E

Nonlinear Channel Routing by Computer,
W75-10543 4A

STANDARD REFERENCE MATERIALS
NBS Adds Foreign Wrinkle to Standards Work,
W75-10490 5A

STANDARDS
Theoretical and Applied Concepts of Water Resources for Social Welfare.
W75-10354 6B

Principles and standards for Water Planning,
W75-10355 6B

Safe Drinking Water Has Become a Federal Case.
W75-10469 5G

STATE JURISDICTION
Program for Control of Discharges of Pollutants to Navigable Waters.
W75-10608 5G

STATIC TESTS
Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) to the Nontarget Fish in Static Tests,
W75-10701 5C

STATIONS
Index to Water Resources Data for Louisiana: Surface Water Records; Water-Quality Records.
W75-10590 5A

STATISTICAL ERRORS
A Model of Statistical Errors in Estimating Streamflow from Continuous-Stage Records,
W75-10512 2E

STATISTICAL MODELS
Proceedings Symposium on Statistical Hydrology.
W75-10507 2A

Some Problems in Pure and Applied Stochastic Hydrology,
W75-10508 2A

Statistical Inference on Streamflow Processes with Markovian Characteristics,
W75-10525 2E

STATISTICAL TOLERANCE LIMITS
Statistical Tolerance Limits for a Pearson Type III Distribution,
W75-10511 2E

STATISTICS
Statistical Tolerance Limits for a Pearson Type III Distribution,
W75-10511 2E

A Model of Statistical Errors in Estimating Streamflow from Continuous-Stage Records,
W75-10512 2E

STEELHEAD TROUT
Acute Toxicity of Kanamycin to Steelhead Trout (Salmo Gairdneri),
W75-10423 5C

STEROIDS
Corticosteroid Concentrations in Sockeye Salmon (Oncorhynchus Nerka) Exposed to Low Concentrations of Copper,
W75-10415 5C

STILLING BASINS
Spillway for Burnsville Dam, Little Kanawha River, West Virginia; Hydraulic Model Investigation,
W75-10665 8B

STOCHASTIC PROCESSES
Proceedings Symposium on Statistical Hydrology.
W75-10507 2A

Stochastic Generation of the Occurrence, Pattern, and Location of Maximum Amount of Daily Rainfall,
W75-10516 2B

A Stochastic Model for Daily Rainfall Data Synthesis,
W75-10518 2B

Stochastic Model of Daily Rainfall,
W75-10520 2B

An Event-Based Stochastic Model of Areal Rainfall and Runoff,
W75-10521 2B

Research in Stochastic Models for Bedload Transport,
W75-10522 2J

A Stochastic Model of Sediment Yield for Ephemeral Streams,
W75-10524 2J

STOMATA
An Analysis of the Mechanics of Guard Cell Motion,
W75-10488 2I

STORM RUNOFF
Flood Waves and Suspended Sediment Pulses in Urbanized Catchments,
W75-10647 4C

STORM WATER
Coping With Urban Runoff in the United States,
W75-10541 5D

STRAW MAN
Panel Review of the Taxonomic Structure of the Straw Man.
W75-10806 6B

Panel Evaluation of the Logical Structure, Consistency, and Underlying Assumptions of the 'Strawman' Methodology.
W75-10807 6B

Methodological Application of the Straw Man Decision Structure to a Hypothetical Case: The Dorfman-Jacoby Water Quality Model,
W75-10811 6A

Social Indicators and Connectives,
W75-10812 6A

Towards a Sharper Concept of an Action Variable,
W75-10813 6A

Methodological Problems in Applying the Straw Man to Real Life Problems,
W75-10814 6A

Qualitative Sign Matrix Manipulation,
W75-10815 6A

Necessary Adaptations for Significant Utilization of the Information System,
W75-10816 6A

A Method of Disaggregation,
W75-10817 6A

Algorithmic Modeling and the Straw Man,
W75-10820 6A

STRAW MAN MODEL
Proceedings of the Graduate Student Symposium of the Technical Committee of the Water Resources Centers of the Thirteen Western States.
W75-10810 6A

STREAM ENRICHMENT
An Investigation of the Ecology and Water Quality of a Lake Outlet,
W75-10724 5C

STREAM GAGES
A Criterion for Vegetation Stiffness,
W75-10782 4A

STREAMFLOW
Multisite Streamflow Simulation of Truckee River, Nevada,
W75-10509 2E

A Model of Statistical Errors in Estimating Streamflow from Continuous-Stage Records,
W75-10512 2E

Statistical Inference on Streamflow Processes with Markovian Characteristics,
W75-10525 2E

Recurrence Intervals of Annual Minimum Streamflows,
W75-10530 2E

A Comparison of Methods for Estimating Flood Peaks on Streams in Massachusetts,
W75-10587 4A

Report on the River Master of the Delaware River for the Period December 1, 1973-November 30, 1974,
W75-10589 4A

Index to Water Resources Data for Louisiana: Surface Water Records; Water-Quality Records.
W75-10590 5A

Low-Flow Characteristics of Mississippi Streams,
W75-10605 2E

A Criterion for Vegetation Stiffness,
W75-10782 4A

Effects of Surface Drainage on Stream Flow,
W75-10794 4A

STREAMS
The Loxahatchee - A River in Distress, Southeast Florida,
W75-10588 4C

Temperatures of Wyoming Streams,
W75-10604 7C

STRESS
Decrease of Net Carbon Flux in Two Species of Mussels Caused by Extracts of Crude Oil,
W75-10433 5C

STRESS ANALYSIS
Pipeline Stress Analysis,
W75-10824 8B

STRUCTURES
Avalanche Protection in Switzerland.
W75-10656 8C

SUBLETHAL CONCENTRATIONS
Uptake, Elimination and Biotransformation of the Lampricide 3-Trifluromethyl-4-Nitrophenol (TFM) by Larvae of the Aquatic Midge Chironomus Tentans,
W75-10629 5C

SUBLETHAL EFFECTS
Corticosteroid Concentrations in Sockeye Salmon (Oncorhynchus Nerka) Exposed to Low Concentrations of Copper,
W75-10415 5C

The Effects of Crude Oil on the Palatability of Marine Crustaceans,
W75-10428 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-nitrophenol (TFM) to 10 Species of Algae,
W75-10697 5C

Toxicity and Residue Dynamics of the Lampricide 3-Trifluoro-Methyl-4-Nitrophenol (TFM) in Aquatic Invertebrates,
W75-10700 5C

SUBLIMATION
Estimating the Transport and Evaporation of Blowing Snow,
W75-10695 2C

SUCCINIC ACID MONO-SULPHO-ESTER
Effect of a Mixture of Succinic Acid Mono-Sulpho-Ester and Olefin Sulfonate on Fish (Uber die Wirkung einer Mischung von Sulfobernsteinsaure-halbester und Olefinsulfonat auf Fische),
W75-10409 5C

SUGAR BEETS
Effect of a Phytoplankton Culture on the Germination and Seedling Development of Barley, Sugar Beets and Lettuce,
W75-10496 3F

SULFATES
Absorption, Metabolism, and Excretion by Goldfish of the Anionic Detergent Sodium Lauryl Sulphate,
W75-10626 5C

The Mutual Destruction of Polluting Factors in Waste Liquors,
W75-10645 5D

SULFITE LIQUORS
Studies on Possibilities of Biochemical Purification of Evaporator Condensate Occurring During Sulfite Pulp Manufacture (Untersuchungen ueber die Moeglichkeit der biochemischen Reinigung des bei der Sulfitzellstoffherstellung anfallenden Eindampfkondensates),
W75-10382 5D

How to Purify Effluents, Recover Byproducts With Reverse Osmosis,
W75-10391 5F

SULFUR BACTERIA
The Mutual Destruction of Polluting Factors in Waste Liquors,
W75-10645 5D

SULFUR COMPOUNDS
Effect of a Mixture of Succinic Acid Mono-Sulpho-Ester and Olefin Sulfonate on Fish (Uber die Wirkung einer Mischung von Sulfobernsteinsaure-halbester und Olefinsulfonat auf Fische),
W75-10409 5C

SUNFISHES
Uptake of Three Polychlorinated Biphenyls, DDT and DDE by the Green Sunfish, Lepomis Cyanellus Raf.,
W75-10422 5C

Effects of pH on Toxicity of Antimycin to Fish,
W75-10450 5C

SUPPLY
A Connectives Model Relating Water Policy Action Variables to Recreational Opportunity Social Indicators,
W75-10819 6A

SURFACE WATER AVAILABILITY
Hydrologic Reconnaissance of the Southern Uinta Basin, Utah and Colorado,
W75-10585 3B

SURVEYS
Channel Erosion Surveys Along Southern Segment of the Taps Route, Alaska, 1972 and 1973,
W75-10594 8B

SUSPENDED SEDIMENTS
Total Sediment Load by the Extrapolated Data Procedure,
W75-10847 2J

SUSPENDED SOLIDS
Analysis of Alternatives for Removal of Suspended Solids in Pulp and Paper Mill Effluents,
W75-10400 5D

SUSQUEHANNA RIVER (PA)
Flood Plain Information: Bloomsburg, Columbia County, Pennsylvania-Susquehanna River.
W75-10561 4A

Flood Plain Information: West Branch Susquehanna River, Lycoming County, Pennsylvania.
W75-10576 4A

SWAMPS
Hydrology of the Albemarle-Pamlico Region, North Carolina--A Preliminary Report on the Impact of Agricultural Developments,
W75-10602 4C

SWANNANOA RIVER
A Precipitation Data Simulator Using a Second Order Autoregressive Scheme,
W75-10513 2B

SWEDEN
Stockholm Puts Sewage Plants Underground,
W75-10718 5D

SWIMMING
Swimming Performance of Juvenile Coho Salmon (Oncorhynchus Kisutch) Exposed to Bleached Kraft Pulp Mill Effluent,
W75-10387 5C

SWITZERLAND
Avalanche Protection in Switzerland.
W75-10656 8C

SYNERGISTIC EFFECTS
Toxicity of Paired Mixtures of Candidate Forest Insecticides to Rainbow Trout,
W75-10439 5C

Acute Toxicities of 3-Trifluoromethyl-4-Nitrophenol (TFM) and 2',5-Dichloro-4'-Nitrosalicylanilide (Bayer 73) to Larvae of the Midge (Chironomus Tentans),
W75-10698 5C

SYNTHESIS
A Stochastic Model for Daily Rainfall Data Synthesis,
W75-10518 2B

SYSTEMATICS
Fishes of the Hiwassee River System: Ecological and Taxonomic Considerations,
W75-10694 5C

SYSTEMS ANALYSIS
Analysis of a Large Water Distribution System Using Advanced Computer Software,
W75-10720 4A

TAIWAN
Effects of Heavy Metals and Pesticides on the Mass Mortalities of Cultured Shellfishes Along the Southwest Coast of Taiwan, (In Chinese),
W75-10427 5C

TAMPA BAY AREA (FLA)
New Concepts in Suburban Drainage in Florida,
W75-10793 4A

TAMPA BAY (FLA)
Additional Studies of the Fishes, Macroinvertebrates and Hydrological Conditions of Upland Canals in Tampa Bay, Florida,
W75-10617 5C

TAPS ROUTE (ALASKA)
Channel Erosion Surveys Along Southern Segment of the Taps Route, Alaska, 1972 and 1973,
W75-10594 8B

TAR POLLUTION
Tar Pollution of Sierra Leone Beaches,
W75-10472 5B

TELEOSTS
DDT : Short Term Effects on Osmoregulation in Black Surfperch (Embiotoca Jacksoni),
W75-10429 5C

TEMPERATURE
Critical Thermal Maxima of Three Species of Hawaiian Estuarine Fish: A Comparative Study,
W75-10426 5C

Bioassay Data for Marine Pollution Using Sea Urchin Eggs, 1972 and 1973,
W75-10432 5A

The Effect of Temperature and Salinity on Cadmium Uptake by the Blue Crab, Callinectes sapidus,
W75-10448 5C

A Climatological Analysis of North Polar Desert Areas,
W75-10455 2C

Daily Temperature and Salinity of Surface Water of Patuxent River at Solomons, Maryland, Based on 30 Years of Records (1938-1967),
W75-10535 2E

Analog Temperature Records from a Linearized Thermistor Network,
W75-10650 7B

Geothermal Channel and Harbor Ice Control System,
W75-10734 4A

Geothermal Power Plant with High Efficiency,
W75-10845 8C

TEMPERATURES
Processes and Costs Imposed by Environmental Stress,
W75-10461 2C

TEMPORAL DISTRIBUTION
Stochastic Models of Spatial and Temporal Distribution of Thunderstorm Rainfall,
W75-10519 2B

TENNESSEE
Fishes of the Hiwassee River System: Ecological and Taxonomic Considerations,
W75-10694 5C

TENSILE STRENGTH
A Weibull Prediction of the Tensile Strength-Volume Relationship of Snow,
W75-10651 2C

TERBACIL
Water-Soil-Plant Interactions with Terbacil,
W75-10486 5C

TEST WELLS
Hydrogeologic Data for the Farmington River Basin, Connecticut,
W75-10591 7C

TEXAS
Developing Regional Stochastic Data Bases,
W75-10528 2E

Statistical Model of Short-Duration Precipitation Events,
W75-10529 2B

The Drift of Mayflies (Ephemeroptera) in the Brazos River, Texas,
W75-10558 5B

Hydrologic Data for Urban Studies in the Fort Worth, Texas Metropolitan Area, 1973,
W75-10596 7C

Effects of Surface Drainage on Stream Flow,
W75-10794 4A

TEXTILE PRINTING EFFLUENTS
Reclamation of Textile Printing Wastewaters for Direct Recycle,
W75-10676 5D

TFM
Uptake, Elimination and Biotransformation of the Lampricide 3-Trifluromethyl-4-Nitrophenol (TFM) by Larvae of the Aquatic Midge Chironomus Tentans,
W75-10629 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-nitrophenol (TFM) to 10 Species of Algae,
W75-10697 5C

Acute Toxicities of 3-Trifluoromethyl-4-Nitrophenol (TFM) and 2',5-Dichloro-4'-Nitrosalicylanilide (Bayer 73) to Larvae of the Midge (Chironomus Tentans),
W75-10698 5C

Acute Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitro-Phenol (TFM) to Nymphs of Mayflies (Hexagenia Sp.),
W75-10699 5C

Toxicity and Residue Dynamics of the Lampricide 3-Trifluoro-Methyl-4-Nitrophenol (TFM) in Aquatic Invertebrates,
W75-10700 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) to the Nontarget Fish in Static Tests,
W75-10701 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) To Nontarget Fish in Flow- Through Tests,
W75-10702 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) to Selected Aquatic Invertebrates and Frog Larvae,
W75-10703 5C

THAILAND (GULF OF SIAM)
On the Accumulation of Organochlorine Pesticides, PCB and Certain Heavy Metals in Fish and Shellfish from Thai Coastal and Inland Waters,
W75-10616 5B

THALASSIOSIRA PSEUDONANA
The Effects of a No. 2 Fuel Oil and Two Crude Oils on the Growth and Photosynthesis of Microalgae,
W75-10436 5C

THALLIUM
Thallium: Occurrence in the Environment and Toxicity to Fish,
W75-10449 5C

THAWING
Geothermal Channel and Harbor Ice Control System,
W75-10734 4A

THEORETICAL ANALYSIS
Derived Decision Rules for Pollution Control in a General Equilibrium Space Economy,
W75-10360 6C

THERMAL POLLUTION
Influence of a Thermal Effluent on Movement of Brown Bullhead (Ictalurus Nebulosus) as Determined by Ultrasonic Tracking,
W75-10628 5C

The Effect of Prolonged Exposure to Elevated Temperatures on the Biochemical Constituents, Gonadal Development and Shell Deposition of the American Oyster, Crassostrea Virginica,
W75-10849 5C

THERMOMETER
Analog Temperature Records from a Linearized Thermistor Network,
W75-10650 7B

THERMOPHILIC BACTERIA
Production of Microbial Protein From Waste Cellulose by Thermomonospora Fusca, A Thermophilic Actinomycete,
W75-10538 5C

THUNDERSTORMS
Stochastic Models of Spatial and Temporal Distribution of Thunderstorm Rainfall,
W75-10519 2B

TIDAL CURRENTS
Norton Point Dike Study, Coney Island, New York; Hydraulic Model Investigation,
W75-10662 8B

TIGRIOPUS CALIFORNICUS
The Effect of Crude Oil Fractions on the Survival of a Tidepool Copepod, Tigriopus Californicus,
W75-10641 5C

TILE DRAINAGE
Art of Agricultural Drainage Design and Costs,
W75-10797 4A

TILL
Glacier-Flow Patterns and the Origin of Late Wisconsinan Till in the Southern Rocky Mountain Trench, British Columbia,
W75-10539 2C

TIMBER YIELD
Simulating Timber Yields and Hydrologic Impacts Resulting From Timber Harvest on Subalpine Watersheds,
W75-10406 3B

TIME SERIES ANALYSIS
Removal of Periodicities by Differencing and Monthyl Mean Subtraction,
W75-10352 2A

TIN
Fast Separation of Tin (IV) From Tin (II) and From Numerous Metal Ions on Ion-Exchange Papers,
W75-10497 2K

TOKYO BAY
PCBS in the Spotted Sharks, Mustelus Manazo, From Tokyo Bay, (In Japanese),
W75-10622 5A

TOXAPHENE
Toxaphene Effects on Growth and Development of Brook Trout (Salvelinus Fontinalis),
W75-10621 5C

TOXICITY
Toxicity of Pulping Wastes to Fish,
W75-10403 5C

Effect of a Mixture of Succinic Acid Mono-Sulpho-Ester and Olefin Sulfonate on Fish (Uber die Wirkung einer Mischung von Sulfobernsteinsaure-halbester und Olefinsulfonat auf Fische),
W75-10409 5C

Toxic Effects of Aliphatic Chlorinated by-Products from Vinyl Chloride Production on Marine Animals,
W75-10412 5C

Toxicity of Phosphamidon to American Lobsters (Homarus Americanus) Held at 4 and 12C,
W75-10413 5C

Acute Toxicity of Kanamycin to Steelhead Trout (Salmo Gairdneri),
W75-10423 5C

DDT : Short Term Effects on Osmoregulation in Black Surfperch (Embiotoca Jacksoni),
W75-10429 5C

Temperature-Induced Changes in Acute Toxicity of Zinc to Atlantic Salmon (Salmo salar),
W75-10431 5C

Toxic Effects of an Anionic Detergent on the Gills of Rainbow Trout,
W75-10434 5C

The Effects of a No. 2 Fuel Oil and Two Crude Oils on the Growth and Photosynthesis of Microalgae,
W75-10436 5C

Toxicity of Two Synthetic Pyrethrins to Brown Trout,
W75-10438 5C

Toxicity of Paired Mixtures of Candidate Forest Insecticides to Rainbow Trout,
W75-10439 5C

Analysis of Tri-Aryl Phosphate Esters and the Determination of Imol S-140 in Fish Tissue and Water Samples by Gas Chromatography,
W75-10442 5A

Effect of Water Hardness on the Toxicity of a Nonionic Detergent to Fish,
W75-10444 5C

Thallium: Occurrence in the Environment and Toxicity to Fish,
W75-10449 5C

Effects of pH on Toxicity of Antimycin to Fish,
W75-10450 5C

Toxic Trace Elements: Preferential Concentration in Respirable Particles,
W75-10482 5A

Water-Soil-Plant Interactions with Terbacil,
W75-10486 5C

Water Quality Criteria for European Fresh-Water Fish.
W75-10609 5C

Water Quality Criteria for European Freshwater Fish.
W75-10610 5C

Acute Toxicity of Ammonia to Several Developmental, Stages of Rainbow Trout, Salmo Gairdneri,
W75-10619 5C

Effects of Temperature on Development and Survival of Rainbow Trout, Salmo Gairdneri, in Acid Waters,
W75-10623 5C

Uptake, Elimination and Biotransformation of the Lampricide 3-Trifluromethyl-4-Nitrophenol (TFM) by Larvae of the Aquatic Midge Chironomus Tentans,
W75-10629 5C

Effects of Chlorinated Hydrocarbon Pollutants on Growth of Marine Phytoplankton in Culture,
W75-10636 5C

The Effect of Certain Organic Pollutants on Copper Toxicity to Fish (Lebistes Reticulatus),
W75-10637 5C

The Effect of Crude Oil Fractions on the Survival of a Tidepool Copepod, Tigriopus Californicus,
W75-10641 5C

Toxicity of Chlorinated Municipal Wastes to Fish: An Evaluation Based on Michigan Field Data,
W75-10680 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-nitrophenol (TFM) to 10 Species of Algae,
W75-10697 5C

Acute Toxicities of 3-Trifluoromethyl-4-Nitrophenol (TFM) and 2',5-Dichloro-4'-Nitrosalicylanilide (Bayer 73) to Larvae of the Midge (Chironomus Tentans),
W75-10698 5C

Acute Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitro-Phenol (TFM) to Nymphs of Mayflies (Hexagenia Sp.),
W75-10699 5C

Toxicity and Residue Dynamics of the Lampricide 3-Trifluoro-Methyl-4-Nitrophenol (TFM) in Aquatic Invertebrates,
W75-10700 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) to the Nontarget Fish in Static Tests,
W75-10701 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) To Nontarget Fish in Flow- Through Tests,
W75-10702 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) to Selected Aquatic Invertebrates and Frog Larvae,
W75-10703 5C

Combined Effects of Cadmium and Salinity on Development and Survival of Herring Eggs,
W75-10704 5C

Amendments to the Water Act,
W75-10835 5G

The Toxicity of Heavy Metal Ions to Anaerobic Digestion,
W75-10843 5D

TOXINS

Toxicity of Pulping Wastes to Fish,
W75-10403 5C

Effect of Dietary Selenium on Glutathione Peroxidase in the Chick,
W75-10495 5A

TRACE ELEMENTS

Average Trace Element Composition of Low Level Marine Atmospheric Particulates,
W75-10477 5B

Toxic Trace Elements: Preferential Concentration in Respirable Particles,
W75-10482 5A

Removal of Trace Metals During Conventional Water Treatment,
W75-10501 5F

Trace Elements in Melbourne Rivers - An Interlaboratory Analysis,
W75-10649 5A

TRACERS

Residue Analyses on 2-Amino-4 Phenylthiazole, a Piscine Anesthetic, in Fishes-I a Model Radio-Tracer Experiment with Medaka,
W75-10614 5A

TRANS-ALASKA PIPELINE ROUTE

Icings Along the Trans-Alaska Pipeline Route,
W75-10592 2C

TRANS-ALASKA PIPELINE SYSTEM

Channel Erosion Surveys Along Southern Segment of the Taps Route, Alaska, 1972 and 1973,
W75-10594 8B

TRANSFORMATIONS

Comments on the Statistical Distribution of Rainfall per Period Under Various Transformations,
W75-10517 2B

TRANSPORTATION

Computer Simulation of Water Distribution Networks,
W75-10823 4A

Pipeline Stress Analysis,
W75-10824 8B

TREATMENT

Treatability of Leachate from Sanitary Landfills,
W75-10683 5D

TREATMENT FACILITIES

Wisconsin Tissue Mills One Year After Startup of the Effluent Plant,
W75-10378 5D

Process Design Manual for Upgrading Existing Waste Water Treatment Plants.
W75-10396 5D

Manual for Preparation of Environmental Impact Statements for Wastewater Treatment Works, Facilities Plans, and 208 Areawide Waste Treatment Management Plans,
W75-10473 5D

Water and Wastewater Facilities for Florida Housing Developments,
W75-10717 5D

Stockholm Puts Sewage Plants Underground,
W75-10718 5D

Integral Circular Wastewater Treatment Plant,
W75-10729 5D

Port Reception and Treatment Facilities for Oily Waste from Vessels,
W75-10751 5G

Water Quality Factors in Designing a Sewage Plant Based on Public Drainage Statistical Data, (In Japanese),
W75-10838 5D

TRIASSIC ROCKS (MD)

Hydrogeology of the Triassic Rocks of Maryland,
W75-10584 2F

TRICKLE IRRIGATION

Water Use and Production of Trickle Irrigated Onions,
W75-10785 3F

Trickle Irrigation Design Requirements for Row Crops,
W75-10801 3F

TRIFLURALIN DIFFUSION COEFFICIENTS

Prediction of Trifluralin Diffusion Coefficients,
W75-10542 5B

TROUT

Aspects of the Winter Ecology of Juvenile Coho Salmon (Oncorhynchus Kisutch) and Steelhead Trout (Salmo Gairdneri),
W75-10615 5C

Toxaphene Effects on Growth and Development of Brook Trout (Salvelinus Fontinalis),
W75-10621 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) To Nontarget Fish in Flow- Through Tests,
W75-10702 5C

TSUNAMIS
Some Features of Tsunamis on the Pacific Coast of South and North America,
W75-10554 2L

TUNNEL CONSTRUCTION
Stockholm Puts Sewage Plants Underground,
W75-10718 5D

TUNNELS
Rivers in the City,
W75-10723 6B

TURBULENT FLOW
Turbulent Flow in Rectangular Outlet Conduit, Rend Lake Dam, Big Muddy River, Illinois,
W75-10666 8B

TURTLES
Listeria in Aquatic Animals,
W75-10375 2I

ULTRASONICS
Influence of a Thermal Effluent on Movement of Brown Bullhead (Ictalurus Nebulosus) as Determined by Ultrasonic Tracking,
W75-10628 5C

ULTRAVIOLET RADIATION
Color of Pulp Industry Waste Liquors. (7). Color Reduction by Ultraviolet Treatment (In Japanese),
W75-10394 5D

UNDERGROUND STRUCTURES
Stockholm Puts Sewage Plants Underground,
W75-10718 5D

UNIT SOURCE WATERSHEDS
Sediment-Yield Characteristics from Unit Source Watersheds,
W75-10848 2J

UNITED STATES
International Field Year for the Great Lakes.
W75-10547 2H

International Field Year for the Great Lakes.
W75-10548 2H

International Field Year for the Great Lakes.
W75-10549 2H

International Field Year for the Great Lakes.
W75-10550 2H

Art of Agricultural Drainage Design and Costs,
W75-10797 4A

Problems of Water Quality Management in Western River Basin Systems,
W75-10804 5G

UNIVERSAL CONNECTORS
Civil Engineering Laboratory Develops Universal Connector for All Booms.
W75-10468 5G

UPLAND CANALS
Additional Studies of the Fishes, Macroinvertebrates and Hydrological Conditions of Upland Canals in Tampa Bay, Florida,
W75-10617 5C

UPPER RIVER ROUGE (MI)
Flood Plain Information: Upper River Rouge, Minnow Pond Drain, Bell Branch and Tarabusi Creek, Wayne and Oakland Counties, Michigan.
W75-10575 4A

UPPER WHITE RIVER (IND)
A River-Quality Assessment of the Upper White River, Indiana,
W75-10600 5B

URBAN DRAINAGE
Valley Design in Urban Growth Centres,
W75-10643 6B

Determine Urban Runoff the Simple Way,
W75-10716 2E

Effects of Farming - Urban Drainage on Fresh Water,
W75-10802 5G

URBAN HYDROLOGY
Hydrologic Data for Urban Studies in the Fort Worth, Texas Metropolitan Area, 1973,
W75-10596 7C

URBAN RUNOFF
Coping With Urban Runoff in the United States,
W75-10541 5D

Flood Waves and Suspended Sediment Pulses in Urbanized Catchments,
W75-10647 4C

The Effects of Urbanization on Floods of Different Recurrence Interval,
W75-10709 4C

The Perimeter Canal - A New Approach to Discharge Urban Water into a Coastal Mangrove Area,
W75-10773 4A

URBAN WATER SUPPLY
On the Peak-Load Pricing of Urban Water Supply,
W75-10706 6C

URBANIZATION
Hydrologic Data for Urban Studies in the Fort Worth, Texas Metropolitan Area, 1973,
W75-10596 7C

Flood Waves and Suspended Sediment Pulses in Urbanized Catchments,
W75-10647 4C

The Effects of Urbanization on Floods of Different Recurrence Interval,
W75-10709 4C

Rivers in the City,
W75-10723 6B

Impacts of Rural to Urban Water Use,
W75-10772 6D

Optimal Sizing of Urban Flood-Control Systems,
W75-10821 4A

UREAS
Urea in the Waters of Lake Kinneret (Sea of Galilee),
W75-10420 5C

UTAH
Hydrologic Reconnaissance of the Southern Uinta Basin, Utah and Colorado,
W75-10585 3B

Ground-Water Conditions in Utah, Spring of 1975,
W75-10606 2F

VACUUM FILTRATION
Vacuum Filtration Cost Optimization,
W75-10681 5D

VALUE ENGINEERING
Theoretical and Applied Concepts of Water Resources for Social Welfare.
W75-10354 6B

VALVES
Float Valve Provides Variable Flow Rates at Low Pressures,
W75-10789 8C

VARIABILITY
Cross Spectra of Short-Duration Rainfall,
W75-10514 2B

VEGETATION EFFECTS
A Criterion for Vegetation Stiffness,
W75-10782 4A

VEGETATION STIFFNESS
A Criterion for Vegetation Stiffness,
W75-10782 4A

VERMONT
Water Works Improvements--Springfield, Vermont,
W75-10713 3D

VIBRATIONS
Fluid-Dynamic Excitation Involving Flow Instability,
W75-10544 8B

VIRGINIA
Flood Plain Information: Meadow Creek, Albemarle County and Charlottesville, Virginia.
W75-10564 4A

Flood Plain Information: Falling Creek, Chesterfield County, Virginia.
W75-10577 4A

Flood Plain Information: James River, Eagle Rock to Lick Run, Botetourt County, Virginia.
W75-10578 4A

Flood Plain Information: Johnson Creek and Tributary, Chesterfield County, Virginia.
W75-10579 4A

A Predictive Computer Model of the Lower Cretaceous Aquifer, Franklin Area, Southeastern Virginia,
W75-10599 2F

Evaluation of Disposal Areas in James River; Hydraulic Model Investigation,
W75-10669 8B

Will Wastewater Treatment Stop Eutrophication of Impoundments,
W75-10686 5D

VIRGINIAN SEA
Wave Climate Model of the Mid-Atlantic Shelf and Shoreline (Virginian Sea), Model Development, Shelf Geomorphology, and Preliminary Results,
W75-10552 2L

VIRUSES
Sensitivity of Human Diploid Embryonic Lung Cells from Isolation of Echo Viruses from Sewage,
W75-10836 5C

VITAMIN C
Essentiality of Vitamin C in Feeds for Intensively Fed Caged Channel Catfish,
W75-10362 8I

WAIMANO STREAM (HI)
Waimano Stream Flood Control Project, Pearl City, Hawaii; Hydraulic Model Investigation,
W75-10663 8B

WALNUT GULCH WATERSHED (ARIZ)
Stochastic Models of Spatial and Temporal Distribution of Thunderstorm Rainfall,
W75-10519 2B

WASHINGTON
Organic Compounds in Pulp Mill Lagoon Discharge,
W75-10402 5D

Flood Hazards in the Seattle-Tacoma Urban Complex and Adjacent Areas, Washington,
W75-10580 7C

Water Resources of the Toppenish Creek Basin, Yakima Indian Reservation, Washington.
W75-10603 3F

Disposal of Digested Sewage Sludge by Landfill,
W75-10682 5D

Watershed Behavior After Forest Fire in Washington,
W75-10790 4C

WASTE DISCHARGE
Program for Control of Discharges of Pollutants to Navigable Waters.
W75-10608 5G

WASTE DISPOSAL
Ocean Pollutants Pose Potential Danger to Man,
W75-10464 5B

Evaluation of Disposal Areas in James River; Hydraulic Model Investigation,
W75-10669 8B

Sludge Disposal on Agricultural Soil,
W75-10674 5D

Disposal of Liquid Effluent by Land Irrigation at Lagro Celotex Plant,
W75-10679 5D

Disposal of Digested Sewage Sludge by Landfill,
W75-10682 5D

Proceedings of the International Conference on Waste Oil Recovery and Reuse.
W75-10739 5D

Disposal of Used Crankcase and Other Oils in Canada,
W75-10743 5D

Waste Oil in Maryland: A Pollutant or a Resource,
W75-10744 5B

Waste Oil: The Recapture of an Energy Resource (The Generation, Disposal and Recovery of Waste Oil in the New York Metropolitan Area),
W75-10745 5D

Waste Lubricating Oil Characteristics--Do They Vary Geographically, Seasonally, and With Origin,
W75-10746 5B

Disposal and/or Recycle of Air Force Waste Petroleum Oils and Lubricants,
W75-10749 5D

Port Reception and Treatment Facilities for Oily Waste from Vessels,
W75-10751 5G

Shipyard Problems with Oily Wastes,
W75-10753 5B

The Economics of Re-Refining,
W75-10757 5G

Massachusetts Waste Oil Management Activities,
W75-10763 5D

The Waste Oil Industry: A Discussion of Some Issues to Consider in Performing an Economic Analysis,
W75-10767 5G

The Consequences of Accepting Industrial Wastes into Sewers; Water Pollution Research at Stevenage,
W75-10842 5D

WASTE IDENTIFICATION
Automated Sequential Composite Sampling. A New Technique for Water Pollution Study and Control,
W75-10690 5A

WASTE MANAGEMENT
Massachusetts Waste Oil Management Activities,
W75-10763 5D

WASTE OIL RECOVERY
Proceedings of the International Conference on Waste Oil Recovery and Reuse.
W75-10739 5D

Oil Reuse--A National Need,
W75-10740 5D

An Economic Model of Waste Oil Recovery, Reprocessing and Distribution Systems,
W75-10768 5D

WASTE OIL RECOVERY/DISPOSAL PLANT
Pollution Control with a Comprehensive Waste Oil Processing Plant,
W75-10758 5D

WASTE OIL REUSE
Proceedings of the International Conference on Waste Oil Recovery and Reuse.
W75-10739 5D

Oil Reuse--A National Need,
W75-10740 5D

Health Implications of Exposure to Trace Metals from Combustion of Waste Oil,
W75-10765 5C

WASTE POLLUTION SOURCES
Water Pollution Problems Associated with Control of Stack Gas Emission,
W75-10691 5B

WASTE TREATMENT
Study of Solid Waste Management Practices in the Pulp and Paper Industry.
W75-10366 5D

Problems Encountered in Sludge Treatment and Some Advanced Solutions,
W75-10398 5E

Sludge Disposal on Agricultural Soil,
W75-10674 5D

Lagoons Plus Spray Irrigation for Effective Bean Cannery Waste Treatment,
W75-10678 5D

Disposal of Digested Sewage Sludge by Landfill,
W75-10682 5D

Proceedings of the International Conference on Waste Oil Recovery and Reuse.
W75-10739 5D

Disposal and/or Recycle of Air Force Waste Petroleum Oils and Lubricants,
W75-10749 5D

The Navy's Oily Wastes Handling and Disposal Program,
W75-10750 5D

Pollution Control with a Comprehensive Waste Oil Processing Plant,
W75-10758 5D

Experience with the IFP Propane Clarification Process in Re-Refining Spent Crankcase Oils,
W75-10759 5D

Re-Refined Diesel Locomotive Lubricating Oil,
W75-10761 5D

Waste Automotive Lubricating Oil as a Municipal Incinerator Fuel,
W75-10764 5D

Investigations on the Production of Hygienic Compost from Air-Dried Sewage Using Different Additives (Versuche zur Herstellung von hygienisch einwandfreiem Kompost aus luftgetrocknetem Faulschlamm unter Verwendung verschiedener Zusaetze),
W75-10834 5D

WASTE WATER DISPOSAL
Waste Water Treatment: Land Disposal of Waste Water,
W75-10373 5E

WASTE WATER (POLLUTION)
Will Wastewater Treatment Stop Eutrophication of Impoundments,
W75-10686 5D

WASTE WATER TREATMENT
Corrosion and Its Cost in Sewage Treatment,
W75-10364 8G

Problems of Space Biology. Volume 24. The Water Supply of Spacecraft Crews,
W75-10365 5D

Study of Solid Waste Management Practices in the Pulp and Paper Industry.
W75-10366 5D

Reduction of Effluent Pollution at the Arkhangel'sk Mills (Snizhenie zagryaznennosti stochnykh vod na Arkhangel'-skom Kombinate),
W75-10368 5D

Increasing the Efficiency of Flotation Savealls (Povyshenie effektivnosti raboty flotatsionnykh lovushek),
W75-10369 5D

Activated Sludge,
W75-10371 5D

Waste Water Treatment: Lagoons and Oxidation Ponds,
W75-10374 5D

Cellulose Degradation in Waste Water Treatment,
W75-10376 5D

Wisconsin Tissue Mills One Year After Startup of the Effluent Plant,
W75-10378 5D

Effect of Temperature and Sludge Loading on 5-Day BOD Removal and Sludge Settleability in Activated Sludge Systems Treating Bleached Kraft Effluents,
W75-10379 5D

Taio Paper (Company, Iyomishima, Japan) Expands to 1,000,000 Tons/Year,
W75-10380 5D

Analytic Characterization of Sewer Loading by Spent Liquors of the Pulp Industry (Analytische Kennzeichung der Belastung der Vorfluter durch Ablaugen der Zellstoffindustrie),
W75-10381 5D

Studies on Possibilities of Biochemical Purification of Evaporator Condensate Occurring During Sulfite Pulp Manufacture (Untersuchungen ueber die Moeglichkeit der biochemischen Reinigung des bei der Sulfitzellstoffherstellung anfallenden Eindampfkondensates),
W75-10382 5D

Serpaflo: Original Solution to Cleaning Paper Mill Effluents (Serpaflo; La solution originale d'epuration des eaux papeteries),
W75-10389 5D

Rotating Biological Disk Treatment of Kraft Mill Effluents,
W75-10390 5D

How to Purify Effluents, Recover Byproducts With Reverse Osmosis,
W75-10391 5F

Color of Pulp Industry Waste Liquors. (6). Behavior of Color During Waste Treatments (In Japanese),
W75-10393 5D

Color of Pulp Industry Waste Liquors. (7). Color Reduction by Ultraviolet Treatment (In Japanese),
W75-10394 5D

Waste Water Treatment: Sludge Treatment, Utilization, and Disposal,
W75-10395 5D

Process Design Manual for Upgrading Existing Waste Water Treatment Plants.
W75-10396 5D

Industrial Wastes: Paper and Allied Products,
W75-10397 5D

Color Removal From Bleached Kraft Effluents,
W75-10399 5D

Analysis of Alternatives for Removal of Suspended Solids in Pulp and Paper Mill Effluents,
W75-10400 5D

Water Reuse in a Paper Reprocessing Plant,
W75-10401 5D

Plant Performance Using Dissolved Oxygen Control,
W75-10452 5D

Gravity Dewatering of Metal Hydroxide Sludges,
W75-10500 5D

Heat Treatment of Sewage Sludges,
W75-10644 5D

The Mutual Destruction of Polluting Factors in Waste Liquors,
W75-10645 5D

Concentration of Dilute Waste Streams by Ion Exchange Techniques,
W75-10672 5D

Treatment of Milk Truck Washing Wastes by Anerobic Digestion,
W75-10673 5D

Heavy Metals Removal from Wood Preserving Wastewater,
W75-10675 5D

Reclamation of Textile Printing Wastewaters for Direct Recycle,
W75-10676 5D

Lagoons Plus Spray Irrigation for Effective Bean Cannery Waste Treatment,
W75-10678 5D

Disposal of Liquid Effluent by Land Irrigation at Lagro Celotex Plant,
W75-10679 5D

Vacuum Filtration Cost Optimization,
W75-10681 5D

Treatability of Leachate from Sanitary Landfills,
W75-10683 5D

An Effluent Study of a Fresh Water Fish Processing Plant,
W75-10684 5D

Treatment of Winery Wastes by Aerated Lagoon, Activated Sludge, and Rotating Biological Contractor,
W75-10685 5D

Will Wastewater Treatment Stop Eutrophication of Impoundments,
W75-10686 5D

Analysis of Wastewater Treatment Systems for a Meat Processing Plant,
W75-10687 5D

Population Dynamics of Protozoa in Wastewater, and Impact of Environmental Changes,
W75-10689 5D

Domestic Waste Water Reuse--Aspects of the Treatment System,
W75-10708 5D

Water and Wastewater Facilities for Florida Housing Developments,
W75-10717 5D

Stockholm Puts Sewage Plants Underground,
W75-10718 5D

Land Treatment of Municipal Sewage,
W75-10719 5D

Liquefying Refrigerant for Water Desalination with Liquefied Natural Gas and an Intermediate Energy Cycle,
W75-10725 3A

Integral Circular Wastewater Treatment Plant,
W75-10729 5D

Method of Treating Aluminum-Containing Waste Water,
W75-10730 5D

Process for Removing Heavy Metal Ions in Water,
W75-10731 5D

Air and Water Pollution Control,
W75-10732 5D

Closed Recycling System for Water Purification and Waste Reduction,
W75-10735 5D

Removal of Pollutants from Water,
W75-10736 5D

Method of Purification of Waste Water Produced From the Packing of Meat and Aquatic Animals,
W75-10737 5D

Multiple Cycle Process for Wastewater Purification,
W75-10738 5D

Oil Contaminated Water Recycling System,
W75-10760 5D

An Economic Model of Waste Oil Recovery, Reprocessing and Distribution Systems,
W75-10768 5D

Automatic Device for the Operational Control of the Filtration Rate of Suspensions(Automatische Vorrichtung zur Technischen Kontrolle der Filtrationsgeschwindigkeit von Suspensionen),
W75-10830 5D

Water Quality Factors in Designing a Sewage Plant Based on Public Drainage Statistical Data, (In Japanese),
W75-10838 5D

Rate of Phosphorus Uptake by Activated Sludge,
W75-10839 5D

Treatment of Service Water with Ozone,
W75-10840 5D

The Consequences of Accepting Industrial Wastes into Sewers; Water Pollution Research at Stevenage,
W75-10842 5D

The Toxicity of Heavy Metal Ions to Anaerobic Digestion,
W75-10843 5D

WATER ANALYSIS

Determination of Cadmium, Copper, and Lead in Natural Waters After Anion-Exchange Separation,
W75-10385 5A

Determination of Manganese in Natural Waters by Atomic Absortion Spectrometry with a Carbon Tube Atomizer,
W75-10386 5A

Trace Elements in Melbourne Rivers - An Interlaboratory Analysis,
W75-10649 5A

WATER CONSUMPTION

Reduction of Effluent Pollution at the Arkhangel'sk Mills (Snizhenie zagryaznennosti stochnykh vod na Arkhangel'-skom Kombinate),
W75-10368 5D

Instruction for Record Keeping of Water Consumption at the Enterprises of the Paper Indus-

WATER CONSUMPTION

try (Instruktsiya ucheta raskhoda vody na predpriyatiyakh otrasli),
W75-10370 3E

WATER CONTROL
Automation of an Existing Irrigation System - Part I,
W75-10788 8C

WATER COSTS
Water Rates: An Assessment of Current Issues,
W75-10707 6C

WATER DELIVERY
Water Works Improvements--Springfield, Vermont,
W75-10713 3D

WATER DEMAND
On the Peak-Load Pricing of Urban Water Supply,
W75-10706 6C

Water Rates: An Assessment of Current Issues,
W75-10707 6C

The Master Plan for Water-Supply in the Regional Municipality of Ottawa-Carleton,
W75-10710 3D

Impacts of Rural to Urban Water Use,
W75-10772 6D

WATER DISTRIBUTION (APPLIED)
The Master Plan for Water-Supply in the Regional Municipality of Ottawa-Carleton,
W75-10710 3D

Analysis of a Large Water Distribution System Using Advanced Computer Software,
W75-10720 4A

Computer Simulation of Water Distribution Networks,
W75-10823 4A

WATER LAW
Towards a Sharper Concept of an Action Variable,
W75-10813 6A

WATER LEVEL FLUCTUATIONS
Ground-Water Levels in New Mexico, 1972,
W75-10582 4B

A Predictive Computer Model of the Lower Cretaceous Aquifer, Franklin Area, Southeastern Virginia,
W75-10599 2F

WATER LEVELS
Map of the Antelope Valley-East Kern Water Agency Area, California, Showing Ground-Water Subunits and Areas, Location of Wells, and Water-Level Contours for Spring 1974,
W75-10595 7C

Ground-Water Conditions in Utah, Spring of 1975,
W75-10606 2F

WATER MANAGEMENT
Report on the River Master of the Delaware River for the Period December 1, 1973-November 30, 1974,
W75-10589 4A

WATER MANAGEMENT (APPLIED)
Flood Plain Information: Meadow Creek, Albemarle County and Charlottesville, Virginia.
W75-10564 4A

Water Works Improvements--Springfield, Vermont,
W75-10713 3D

WATER-METERING CELLS
Multichannel Toxicant Injection System for Flow-Through Bioassays,
W75-10443 5A

WATER POLICY
Economic Impact of the Conversion of Water from Irrigation to Municipal and Industrial Use in the Rio Grande Basin of New Mexico,
W75-10771 6D

Impacts of Rural to Urban Water Use,
W75-10772 6D

A Connectives Model Relating Water Policy Action Variables to Recreational Opportunity Social Indicators,
W75-10819 6A

WATER POLLUTANT EFFECTS
Effects of Chlorinated Hydrocarbon Pollutants on Growth of Marine Phytoplankton in Culture,
W75-10636 5C

The Effect of Certain Organic Pollutants on Copper Toxicity to Fish (Lebistes Reticulatus),
W75-10637 5C

WATER POLLUTION
Predicting the Concentration of Aquatic Herbicide Residues in Waterways,
W75-10648 5B

Trace Elements in Melbourne Rivers - An Interlaboratory Analysis,
W75-10649 5A

Amendments to the Water Act,
W75-10835 5G

WATER POLLUTION CONTROL
Reduction of Effluent Pollution at the Arkhangel'sk Mills (Snizhenie zagryaznennosti stochnykh vod na Arkhangel'skom Kombinate),
W75-10368 5D

New Legislative Tendencies for Control of Water Pollution (Nuevas tendencias legislativas en el control de la contaminacion de las aguas),
W75-10384 5G

Plant Performance Using Dissolved Oxygen Control,
W75-10452 5D

USCG Sets Broader Use of Pollution Control Systems,
W75-10466 5G

Civil Engineering Laboratory Develops Universal Connector for All Booms.
W75-10468 5G

EPA's Effluent Guidelines Have Their Day in Court.
W75-10470 5G

Feasibility Test Program of Application of Coalescing Phase Oil/Water Separators to Self Compensating Fuel Tanks in Surface Ships,
W75-10474 5G

Guidelines for Landfill of Toxic Industrial Sludges,
W75-10487 5G

Jettisoning of LNG at Sea--An Unresolved Pollution Hazard.
W75-10633 5G

Marine Floating Screen.
W75-10634 5G

Recovering Oil Spills from Water.
W75-10635 5G

Oil and Debris Removal Unit,
W75-10726 5G

Oil Separation and Recovery Device,
W75-10728 5G

Integral Circular Wastewater Treatment Plant,
W75-10729 5D

Method of Treating Aluminum-Containing Waste Water,
W75-10730 5D

Method of Purification of Waste Water Produced From the Packing of Meat and Aquatic Animals,
W75-10737 5D

Effects of Farming - Urban Drainage on Fresh Water,
W75-10802 5G

Methodological Application of the Straw Man Decision Structure to a Hypothetical Case: The Dorfman-Jacoby Water Quality Model,
W75-10811 6A

Methodological Problems in Applying the Straw Man to Real Life Problems,
W75-10814 6A

WATER POLLUTION EFFECTS
The Economic Impact of Mercury Pollution on Fisheries and Other Related Businesses Around Pickwick Lake,
W75-10356 5G

Industrial Interdependencies and External Diseconomies of Water Resources,
W75-10358 6B

Swimming Performance of Juvenile Coho Salmon (Oncorhynchus Kisutch) Exposed to Bleached Kraft Pulp Mill Effluent,
W75-10387 5C

Effects of Acute Exposure to Bleached Kraft Pulp Mill Effluent on Carbohydrate Metabolism of Juvenile Coho Salmon (Oncorhynchus Kisutch) During Rest and Exercise,
W75-10388 5C

Toxicity of Pulping Wastes to Fish,
W75-10403 5C

Effects of Heavy Metals and Pesticides on the Mass Mortalities of Cultured Shellfishes Along the Southwest Coast of Taiwan, (in Chinese),
W75-10427 5C

Heavy Metal Contents of Fishes Caught in Kaohsiung Harbor, (In Chinese),
W75-10430 5A

Temperature-Induced Changes in Acute Toxicity of Zinc to Atlantic Salmon (Salmo salar),
W75-10431 5C

Toxic Effects of an Anionic Detergent on the Gills of Rainbow Trout,
W75-10434 5C

Ocean Pollutants Pose Potential Danger to Man,
W75-10464 5B

International Exploration Locates Minerals and Oils,
W75-10467 5B

The Effect of Crude Oil Fractions on the Survival of a Tidepool Copepod, Tigriopus Californicus,
W75-10641 5C

Analysis of Pollution from Marine Engines - Status Report,
W75-10688 5A

WATER POLLUTION SOURCES
Adsorption and Degradation of Chlorbromuron in Soil,
W75-10414 5B

International Exploration Locates Minerals and Oils,
W75-10467 5B

Tar Pollution of Sierra Leone Beaches,
W75-10472 5B

A River-Quality Assessment of the Upper White River, Indiana,
W75-10600 5B

Problems Related to Water Quality and Algal Control in Lopez Reservoir, San Luis Obispo County, California,
W75-10601 5B

Waste Oil Management--The Environmental Protection Agency's Role,
W75-10742 5G

Containment, Collection and Recycling of Oily Wastes,
W75-10747 5G

Oily Bilge from Commercial Vessels,
W75-10752 5B

A Program for Handling Emergency Oil Spillages in the Port of Baltimore,
W75-10755 5G

Five Year Study of Des Moines River Water Quality,
W75-10803 5B

Sensitivity of Human Diploid Embryonic Lung Cells from Isolation of Echo Viruses from Sewage,
W75-10836 5C

ACTMO, An Agricultural Chemical Transport Model,
W75-10846 5B

WATER POLLUTION TREATMENT
Removal of Trace Metals During Conventional Water Treatment,
W75-10501 5F

Process for Removing Heavy Metal Ions in Water,
W75-10731 5D

Removal of Pollutants from Water,
W75-10736 5D

Multiple Cycle Process for Wastewater Purification,
W75-10738 5D

WATER PURIFICATION
Treatment Processes for Coping with Variation in Raw-Water Quality,
W75-10705 5F

Domestic Waste Water Reuse--Aspects of the Treatment System,
W75-10708 5D

Water and Wastewater Facilities for Florida Housing Developments,
W75-10717 5D

Liquefying Refrigerant for Water Desalination with Liquefied Natural Gas and an Intermediate Energy Cycle,
W75-10725 3A

Rotary Desalination Engine and System,
W75-10733 3A

Removal of Pollutants from Water,
W75-10736 5D

Method of Purification of Waste Water Produced From the Packing of Meat and Aquatic Animals,
W75-10737 5D

Investigations on the Production of Hygienic Compost from Air-Dried Sewage Using Different Additives (Versuche zur Herstellung von hygienisch einwandfreiem Kompost aus luftgetrocknetem Faulschlamm unter Verwendung verschiedener Zusaetze),
W75-10834 5D

WATER QUALITY
Geological and Limnological Factors of Cold Deserts,
W75-10457 2C

Daily Temperature and Salinity of Surface Water of Patuxent River at Solomons, Maryland, Based on 30 Years of Records (1938-1967),
W75-10535 2E

Evaluation of Ground Water Resources: Sacramento County,
W75-10546 2F

Index to Water Resources Data for Louisiana: Surface Water Records; Water-Quality Records.
W75-10590 5A

A River-Quality Assessment of the Upper White River, Indiana,
W75-10600 5B

Rivers in the City,
W75-10723 6B

An Investigation of the Ecology and Water Quality of a Lake Outlet,
W75-10724 5C

Agricultural and Urban Considerations in Irrigation and Drainage.
W75-10769 4A

Wellton-Mohawk Drainage and the Mexican Salt Problem,
W75-10783 4A

Evaluation of Agricultural Drainage in Water Quality Management,
W75-10796 5G

Five Year Study of Des Moines River Water Quality,
W75-10803 5B

Problems of Water Quality Management in Western River Basin Systems,
W75-10804 5G

Effect of Agricultural Use on Water Quality for Downstream Use for Irrigation,
W75-10805 5G

WATER QUALITY CONTROL
International Production Aspects of Water and Environmental Quality Control,
W75-10357 5G

Marine Pollution Bioassay by Sea Urchin Eggs, An Attempt to Enhance Accuracy,
W75-10419 5A

Bioassay Data for Marine Pollution Using Sea Urchin Eggs, 1972 and 1973,
W75-10432 5A

Treatment Processes for Coping with Variation in Raw-Water Quality,
W75-10705 5F

Deterioration of Water Quality in Distribution Systems,
W75-10711 5F

Oil and Debris Removal Unit,
W75-10726 5G

Air and Water Pollution Control,
W75-10732 5D

Rotary Desalination Engine and System,
W75-10733 3A

Removal of Pollutants from Water,
W75-10736 5D

Method of Purification of Waste Water Produced From the Packing of Meat and Aquatic Animals,
W75-10737 5D

Social Indicators and Connectives,
W75-10812 6A

Water Quality Factors in Designing a Sewage Plant Based on Public Drainage Statistical Data, (In Japanese),
W75-10838 5D

WATER QUALITY STANDARDS
Safe Drinking Water Has Become a Federal Case.
W75-10469 5G

EPA's Effluent Guidelines Have Their Day in Court.
W75-10470 5G

P. L. 92-500 (Two Years Later) is Not the Answer,
W75-10471 5G

The Laws and Their Enforcement; Progress Amidst Problems,
W75-10607 5G

Program for Control of Discharges of Pollutants to Navigable Waters.
W75-10608 5G

Water Quality Criteria for European Freshwater Fish.
W75-10609 5C

Biological Bases for Water Quality Standards,
W75-10677 5G

WATER QUALITYSTANDARDS
Water Quality Criteria for European Freshwater Fish.
W75-10610 5C

WATER RATES
Political Participation and Water Rates. A Closer Look,
W75-10361 6C

Water Rates: An Assessment of Current Issues,
W75-10707 6C

WATER RESOURCES
Theoretical and Applied Concepts of Water Resources for Social Welfare.
W75-10354 6B

Water Resources of the Toppenish Creek Basin, Yakima Indian Reservation, Washington.
W75-10603 3F

Egalitarianism,
W75-10818 6A

A Connectives Model Relating Water Policy Action Variables to Recreational Opportunity Social Indicators,
W75-10819 6A

WATER RESOURCES DEVELOPMENT
Analyzing Reimbursement Mechanisms for Resource Development Projects,
W75-10353 6C

Water for Industrial Development in Alcorn, Itawamba, Prentiss, and Tishomingo Counties, Mississippi,
W75-10581 3E

Hydrologic Reconnaissance of the Southern Uinta Basin, Utah and Colorado,
W75-10585 3B

Rivers in the City,
W75-10723 6B

Panel Review of the Taxonomic Structure of the Straw Man.
W75-10806 6B

Panel Evaluation of the Logical Structure, Consistency, and Underlying Assumptions of the 'Strawman' Methodology.
W75-10807 6B

Comments on the Straw Man,
W75-10808 6B

Report to the Technical Committee of the Water Resources Centers of the Thirteen Western States,
W75-10809 6B

Proceedings of the Graduate Student Symposium of the Technical Committee of the Water Resources Centers of the Thirteen Western States.
W75-10810 6A

Methodological Application of the Straw Man Decision Structure to a Hypothetical Case: The Dorfman-Jacoby Water Quality Model,
W75-10811 6A

Social Indicators and Connectives,
W75-10812 6A

Towards a Sharper Concept of an Action Variable,
W75-10813 6A

Methodological Problems in Applying the Straw Man to Real Life Problems,
W75-10814 6A

Qualitative Sign Matrix Manipulation,
W75-10815 6A

A Method of Disaggregation,
W75-10817 6A

Algorithmic Modeling and the Straw Man,
W75-10820 6A

WATER RESOURCES INDEX (LA)
Index to Water Resources Data for Louisiana: Surface Water Records; Water-Quality Records.
W75-10590 5A

WATER REUSE
Problems of Space Biology. Volume 24. The Water Supply of Spacecraft Crews,
W75-10365 5D

Waste Water Treatment: Water Reclamation and Reuse,
W75-10372 5D

Taio Paper (Company, Iyomishima, Japan) Expands to 1,000,000 Tons/Year,
W75-10380 5D

Water Reuse in a Paper Reprocessing Plant,
W75-10401 5D

Water-Quality Requirements for the Petroleum Industry,
W75-10465 5D

Reclamation of Textile Printing Wastewaters for Direct Recycle,
W75-10676 5D

Domestic Waste Water Reuse--Aspects of the Treatment System,
W75-10708 5D

Land Treatment of Municipal Sewage,
W75-10719 5D

Water Supply from Renovated Wastewater--A Resource Manual for Massachusetts Planners, Public Officials and Citizen Groups.
W75-10722 5D

Utilization of Sewage Effluent for Irrigation,
W75-10798 5D

WATER STORAGE
Water Collection and Storage Dispersion Apparatus,
W75-10727 4A

WATER SUPPLY
Problems of Space Biology. Volume 24. The Water Supply of Spacecraft Crews,
W75-10365 5D

Evaluation of Ground Water Resources: Sacramento County,
W75-10546 2F

On the Peak-Load Pricing of Urban Water Supply,
W75-10706 6C

Water Collection and Storage Dispersion Apparatus,
W75-10727 4A

WATER SUPPLY DEVELOPMENT
Domestic Waste Water Reuse--Aspects of the Treatment System,
W75-10708 5D

The Master Plan for Water-Supply in the Regional Municipality of Ottawa-Carleton,
W75-10710 3D

Water Works Improvements--Springfield, Vermont,
W75-10713 3D

Water and Wastewater Facilities for Florida Housing Developments,
W75-10717 5D

Water Supply from Renovated Wastewater--A Resource Manual for Massachusetts Planners, Public Officials and Citizen Groups.
W75-10722 5D

WATER TABLE
Drainage Analysis of a Confining Formation,
W75-10780 4A

WATER TEMPERATURE
Toxicity of Phosphamidon to American Lobsters (Homarus Americanus) Held at 4 and 12C,
W75-10413 5C

Temperature-Induced Changes in Acute Toxicity of Zinc to Atlantic Salmon (Salmo salar),
W75-10431 5C

Laboratory Measurement of Surface Temperature Fluctuations Induced by Small Amplitude Surface Waves,
W75-10505 2L

Temperatures of Wyoming Streams,
W75-10604 7C

Effects of Temperature on Development and Survival of Rainbow Trout, Salmo Gairdneri, in Acid Waters,
W75-10623 5C

WATER TREATMENT
Organic Matter in Natural Water and Water Treatment,
W75-10351 5B

Use of Organic Flocculants for Textile Plant Water Treatment (Pouziti organickych flokulantu k cireni vody pro technologii textilni vyroby),
W75-10383 5F

Removal of Trace Metals During Conventional Water Treatment,
W75-10501 5F

Treatment Processes for Coping with Variation in Raw-Water Quality,
W75-10705 5F

Deterioration of Water Quality in Distribution Systems,
W75-10711 5F

Water Supply from Renovated Wastewater--A Resource Manual for Massachusetts Planners, Public Officials and Citizen Groups.
W75-10722 5D

WATER UTILIZATION
Agricultural and Urban Considerations in Irrigation and Drainage.
W75-10769 4A

WATER WAVE GENERATION
A Numerical Model for Predicting the Effects of Landslide-Generated Water Waves,
W75-10661 8A

WATER WELLS
Hydrological Data From Wells in Southwest Hillsborough County, Florida, 1950-74,
W75-10593 7C

Map of the Antelope Valley-East Kern Water Agency Area, California, Showing Ground-Water Subunits and Areas, Location of Wells, and Water-Level Contours for Spring 1974,
W75-10595 7C

WATER WORKS
Financing Water Works,
W75-10712 3D

WATER YIELD
Watershed Management in the Rocky Mountain Subalpine Zone: The Status of Our Knowledge,
W75-10405 3B

Simulating Timber Yields and Hydrologic Impacts Resulting From Timber Harvest on Subalpine Watersheds,
W75-10406 3B

WATER YIELD IMPROVEMENT
Water-Yield Improvement from Alpine Areas: The Status of Our Knowledge,
W75-10660 3B

WATERFOWL
Effects of Methylmercury on Approach and Avoidance Behavior of Mallard Ducklings,
W75-10424 5C

WATERSHED (BASINS)
Sediment-Yield Characteristics from Unit Source Watersheds,
W75-10848 2J

WATERSHED MANAGEMENT
Watershed Management in the Rocky Mountain Subalpine Zone: The Status of Our Knowledge,
W75-10405 3B

Simulating Timber Yields and Hydrologic Impacts Resulting From Timber Harvest on Subalpine Watersheds,
W75-10406 3B

Watershed Management Problems and Opportunities for the Colorado Front Range Ponderosa Pine Zone: The Status of Our Knowledge,
W75-10655 4D

WATERSHEDS (BASINS)
Cross Spectra of Short-Duration Rainfall,
W75-10514 2B

Pedologic Cover of the Watershed of the Porecka River,
W75-10551 2A

Watershed Behavior After Forest Fire in Washington,
W75-10790 4C

WAVES (WATER)
Wave Climate Model of the Mid-Atlantic Shelf and Shoreline (Virginian Sea), Model Development, Shelf Geomorphology, and Preliminary Results,
W75-10552 2L

Lake Erie International Jetport Model Feasibility Investigation, Physical Model Feasibility Study,
W75-10670 8B

WEATHER INFORMATION
Operational Value of Weather Information in Relation to Soil Management Characteristics,
W75-10367 2G

WEATHER MODIFICATION
Land Use Simulation Model of the Subalpine Coniferous Forest Zone,
W75-10404 3B

Priority Problems for Modifying Cumulus Precipitation,
W75-10774 3B

Weather Modification for Use in the High Plains,
W75-10775 3B

Users' View of Weather Modification,
W75-10776 3B

Role of the Public in Weather Modification,
W75-10777 3B

WEATHERING
Some Effects of Field Weathering of Seed Cotton in a Desert Environment,
W75-10557 3F

WEIBULL PREDICTION
A Weibull Prediction of the Tensile Strength-Volume Relationship of Snow,
W75-10651 2C

WELFARE (ECONOMICS)
Theoretical and Applied Concepts of Water Resources for Social Welfare.
W75-10354 6B

Principles and standards for Water Planning,
W75-10355 6B

WELLTON-MOHAWK DRAINAGE
Wellton-Mohawk Drainage and the Mexican Salt Problem,
W75-10783 4A

WEST VIRGINIA
Spillway for Burnsville Dam, Little Kanawha River, West Virginia; Hydraulic Model Investigation,
W75-10665 8B

WESTERN UNITED STATES
Problems of Water Quality Management in Western River Basin Systems,
W75-10804 5G

WET SCRUBBERS
Water Pollution Problems Associated with Control of Stack Gas Emission,
W75-10691 5B

WHEAT
Protein Content of Winter Wheat Grain as Related to Soil and Climatic Factors in the Semi-Arid Central Great Plains,
W75-10792 3F

Flooding and Soil Temperature Effects on Wheat During Grain Filling,
W75-10829 3F

WHITE CLAY CREEK (DE)
Flood Plain Information: White Clay Creek, New Castle County, Delaware.
W75-10571 4A

WILDLIFE CONSERVATION
Water Collection and Storage Dispersion Apparatus,
W75-10727 4A

WINDBREAKS
New Engineering Criteria for Snow Fence Systems,
W75-10692 2C

New Snow Fence Design Controls Drifts, Improves Visibility, Reduces Road Ice,
W75-10693 2C

WINDSPEED
Canopy Weight Distribution Affects Windspeed and Temperature in a Lodgepole Pine Forest,
W75-10654 4A

WINERY WASTES
Treatment of Winery Wastes by Aerated Lagoon, Activated Sludge, and Rotating Biological Contractor,
W75-10685 5D

WISCONSIN
Wisconsin Tissue Mills One Year After Startup of the Effluent Plant,
W75-10378 5D

Environmental Limitations on the Microbial Degradation of Hydrocarbons in Temperate Lakes,
W75-10407 5C

Treatability of Leachate from Sanitary Landfills,
W75-10683 5D

WOOD PRESERVATIVES (PESTICIDES)
Heavy Metals Removal from Wood Preserving Wastewater,
W75-10675 5D

WORMS
Toxic Effects of Aliphatic Chlorinated by-Products from Vinyl Chloride Production on Marine Animals,
W75-10412 5C

WYOMING
Temperatures of Wyoming Streams,
W75-10604 7C

Canopy Weight Distribution Affects Windspeed and Temperature in a Lodgepole Pine Forest,
W75-10654 4A

New Engineering Criteria for Snow Fence Systems,
W75-10692 2C

New Snow Fence Design Controls Drifts, Improves Visibility, Reduces Road Ice,
W75-10693 2C

Estimating the Transport and Evaporation of Blowing Snow,
W75-10695 2C

X-RAY ANALYSIS
Determination of the Transition Metals Manganese, Iron, Cobalt, Copper and Zinc in River Fishes With Help of X-Ray Fluorescence Analysis and Flameless Atomic Absorption Spectroscopy, (Bestimmung der Ubergangsmetalle Mangan, Eisen, Kobalt, Kupfer und zink in Flussfischen mit Hilfe der Rontgenfluores-zenzanalyse und der flammenlosen Atomabsorption),
W75-10408 5A

X-ray Microanalysis of Zinc and Iron in the Cheloride Cells of Mayfly Larvae of the River Sulz, (Rontgenmikroanalyse von Zink und Eisen in Chloridzellen von Eintagsfligenlarven aus der Sulz),
W75-10416 5A

X-RAY FLUORESCENCE
Determination of the Transition Metals Manganese, Iron, Cobalt, Copper and Zinc in River Fishes With Help of X-Ray Fluorescence Analysis and Flameless Atomic Absorption Spectroscopy, (Bestimmung der Ubergangsmetalle Mangan, Eisen, Kobalt, Kupfer und zink in Flussfischen mit Hilfe der Rontgenfluores-zenzanalyse und der flammenlosen Atomabsorption),
W75-10408 5A

YAKIMA INDIAN RESERVATION (WASH)
Water Resources of the Toppenish Creek Basin, Yakima Indian Reservation, Washington.
W75-10603 3F

YELLOW TAIL
Physiological Changes in the Serum and Hepatopancreas of Yellow Tail Injected with Carbon Tetrachloride, (In Japanese),
W75-10630 5C

YELLOWTAIL
Experimental Investigation on the Biological Concentration of Mercury-I. On the Rate of Mercury Transfer Through the Food Chain From Jack Mackerel to Young Yellowtail (In Japanese),
W75-10441 5C

YUGOSLAVIA (PORECKA RIVER)
Pedologic Cover of the Watershed of the Porecka River,
W75-10551 2A

ZECTRAN
Effect of the Insecticide Zectran (Mexacarbate) on Several Algae,
W75-10425 5C

ZINC
X-ray Microanalysis of Zinc and Iron in the Cheloride Cells of Mayfly Larvae of the River Sulz, (Rontgenmikroanalyse von Zink und Eisen in Chloridzellen von Eintagsfligenlarven aus der Sulz),
W75-10416 5A

Heavy Metal Contents of Fishes Caught in Kaohsiung Harbor, (In Chinese),
W75-10430 5A

Temperature-Induced Changes in Acute Toxicity of Zinc to Atlantic Salmon (Salmo salar),
W75-10431 5C

Response of Freshwater Protozoan Artificial Communities to Metals,
W75-10440 5C

Absorption of Cadmium, Copper and Zinc by Dog Whelks in the Bristol Channel,
W75-10481 5B

Water Quality Criteria for European Freshwater Fish.
W75-10610 5C

Copper, Zinc and Total Protein Levels in the Plasma of Sockeye Salmon (Oncorhynchus Nerka) During Their Spawning Migration,
W75-10613 5C

The Effect of Sublethal Concentrations of Copper and Zinc on Ventilatory Activity, Blood Oxygen, and pH in Rainbow Trout (Salmo Gairdneri),
W75-10624 5C

ZOOPLANKTON
Urea in the Waters of Lake Kinneret (Sea of Galilee),
W75-10420 5C

ZURN-ATTISHOLZ PROCESS
Wisconsin Tissue Mills One Year After Startup of the Effluent Plant,
W75-10378 5D

AUTHOR INDEX

AAGAARD, K.
Toward an Ice-Free Arctic Ocean,
W75-10532 2C

ABEL, P. D.
Toxic Effects of an Anionic Detergent on the Gills of Rainbow Trout,
W75-10434 5C

ABLES, J. H. JR.
Flood Control Project on Lytle and Warm Creeks and Santa Ana River, California; Hydraulic Model Investigation,
W75-10668 8B

ADAMS, C. E. JR.
Analysis of Alternatives for Removal of Suspended Solids in Pulp and Paper Mill Effluents,
W75-10400 5D

AKITAKE, H.
Studies on the Metabolism of Chlorophenols in Fish-I Absorption and Excretion of PCP by Goldfish,
W75-10417 5C

Studies on the Metabolism of Chlorophenols in Fish-II Turnover in Absorbed PCP in Goldfish,
W75-10418 5C

Studies on the Metabolism of Chlorophenols in Fish-III Isolation and Identification of a Conjugated PCP Excreted by Goldfish,
W75-10611 5A

ALEXANDER, R. R.
Simulating Timber Yields and Hydrologic Impacts Resulting From Timber Harvest on Subalpine Watersheds,
W75-10406 3B

ALLEN, G. R.
Water Works Improvements--Springfield, Vermont,
W75-10713 3D

ALLEN, P. B.
Total Sediment Load by the Extrapolated Data Procedure,
W75-10847 2J

AMOROCHO, J.
Some Factors Affecting Control of Flow in a Large Canal System,
W75-10786 8B

ANDERSON, J. R.
Gravity Dewatering of Metal Hydroxide Sludges,
W75-10500 5D

ANDREWS, J. W.
Experience with the IFP Propane Clarification Process in Re-Refining Spent Crankcase Oils,
W75-10759 5D

Growth Factors in the Fish Meal Components of Catfish Diets,
W75-10658 2I

ANTONELLI, A.
Liquefying Refrigerant for Water Desalination with Liquefied Natural Gas and an Intermediate Energy Cycle,
W75-10725 3A

APARICIO FERRATER, I.
New Legislative Tendencies for Control of Water Pollution (Nuevas tendencias legislativas en el control de la contaminacion de las aguas),
W75-10384 5G

ARMSTRONG, A. S.
Port Reception and Treatment Facilities for Oily Waste from Vessels,
W75-10751 5G

ARMSTRONG, D. A.
Effects of the Insecticide Sevin and Its First Hydrolytic Product, 1-Napthol, on Some Early Developmental Stages of the Bay Mussel, Mytilus edulis,
W75-10435 5C

ARNAIZ, J. B.
Feasibility Test Program of Application of Coalescing Phase Oil/Water Separators to Self Compensating Fuel Tanks in Surface Ships,
W75-10474 5G

ATHOW, R. F. JR.
Norton Point Dike Study, Coney Island, New York; Hydraulic Model Investigation,
W75-10662 8B

ATTAR, A. M.
Environmental Action at Port Authority Airports,
W75-10748 5G

AULENBACH, D. B.
Treatment of Milk Truck Washing Wastes by Anerobic Digestion,
W75-10673 5D

AUSTIN, T. A.
Statistical Model of Short-Duration Precipitation Events,
W75-10529 2B

AVERETT, R. C.
Problems Related to Water Quality and Algal Control in Lopez Reservoir, San Luis Obispo County, California,
W75-10601 5B

AYERS, F. E.
The Master Plan for Water-Supply in the Regional Municipality of Ottawa-Carleton,
W75-10710 3D

AZAR, J. J.
Pipeline Stress Analysis,
W75-10824 8B

BACIU, P.
Geothermal Power Plant with High Efficiency,
W75-10845 8C

BAERSCH, L.
Principles of Establishing Sewer Systems in the Rural Settlements of Magdeburg County (Grundlagen fuer die Abwasser-Technische Erschliessung von Landgemeinden im Bezirk Magdeburg),
W75-10833 5D

BAKER, M. M.
Industrial Interdependencies and External Diseconomies of Water Resources,
W75-10358 6B

BAKER, V. R.
Competence of Rivers to Transport Coarse Bedload Material,
W75-10540 2J

BANSAL, I. K.
How to Purify Effluents, Recover Byproducts With Reverse Osmosis,
W75-10391 5F

BARNES, B. B.
Total Sediment Load by the Extrapolated Data Procedure,
W75-10847 2J

BARNETT, C. J.
The Effect of Crude Oil Fractions on the Survival of a Tidepool Copepod, Tigriopus Californicus,
W75-10641 5C

BARRY, R. G.
A Climatological Analysis of North Polar Desert Areas,
W75-10455 2C

BASCH, R.
Toxicity of Chlorinated Municipal Wastes to Fish: An Evaluation Based on Michigan Field Data,
W75-10680 5C

BASS, M. L.
The Effect of Sublethal Concentrations of Copper and Zinc on Ventilatory Activity, Blood Oxygen, and pH in Rainbow Trout (Salmo Gairdneri),
W75-10624 5C

BATUTIS, E.
Feasibility Test Program of Application of Coalescing Phase Oil/Water Separators to Self Compensating Fuel Tanks in Surface Ships,
W75-10474 5G

BAUMANN, E. R.
Five Year Study of Des Moines River Water Quality,
W75-10803 5B

BEACH, J. S.
Automated Sequential Composite Sampling. A New Technique for Water Pollution Study and Control,
W75-10690 5A

BEACH, M. I.
Automated Sequential Composite Sampling. A New Technique for Water Pollution Study and Control,
W75-10690 5A

BEARD, L. R.
Developing Regional Stochastic Data Bases,
W75-10528 2E

BECKERMAN, W.
Pollution Control and Optimal Taxation: A Static Analysis,
W75-10359 6E

BEDARD, R. G.
An Evaluation of Persistency for Water Borne Organics,
W75-10850 5B

BENDER, M. E.
Analysis of Pollution from Marine Engines - Status Report,
W75-10688 5A

BENNETT, A. C.
Effects of Surface Drainage on Stream Flow,
W75-10794 4A

BENNETT, E. R.
Vacuum Filtration Cost Optimization,
W75-10681 5D

BENNETT, G. H.
Population Dynamics of Protozoa in Wastewater, and Impact of Environmental Changes,
W75-10689 5D

BENZ, L. C.
Drainage Analysis of a Confining Formation,
W75-10780 4A

BERMAN, T.
Urea in the Waters of Lake Kinneret (Sea of Galilee),
W75-10420 5C

BERNSTEIN, L.
Irrigation Management for Salt Control,
W75-10800 3C

BIELBY, D. G.
Phosphorus in Percolates from Manured Lysimeters,
W75-10573 5B

BIGLER, E. R.
Effect of a Phytoplankton Culture on the Germination and Seedling Development of Barley, Sugar Beets and Lettuce,
W75-10496 3F

BILLS, T. D.
Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) To Nontarget Fish in Flow- Through Tests,
W75-10702 5C

BISHOP, W. M.
Effects of Farming - Urban Drainage on Fresh Water,
W75-10802 5G

BITTNER, M. A.
Uptake, Elimination and Biotransformation of the Lampricide 3-Trifluromethyl-4-Nitrophenol (TFM) by Larvae of the Aquatic Midge Chironomus Tentans,
W75-10629 5C

BLACK, J. A.
The Effect of Certain Organic Pollutants on Copper Toxicity to Fish (Lebistes Reticulatus),
W75-10637 5C

BLOYD, R. M. JR.
Summary Appraisals of the Nation's Ground-Water Resources--Ohio Region,
W75-10598 4B

BOAR, P. L.
Trace Elements in Melbourne Rivers - An Interlaboratory Analysis,
W75-10649 5A

BOBB, W. H.
Evaluation of Disposal Areas in James River; Hydraulic Model Investigation,
W75-10669 8B

Norton Point Dike Study, Coney Island, New York; Hydraulic Model Investigation,
W75-10662 8B

BODE, L. E.
Prediction of Trifluralin Diffusion Coefficients,
W75-10542 5B

BOELSCH, G.
Principles of Establishing Sewer Systems in the Rural Settlements of Magdeburg County (Grundlagen fuer die Abwasser-Technische Erschliessung von Landgemeinden im Bezirk Magdeburg),
W75-10833 5D

BOERSMA, L.
A Theory of the Mass Transport of Previously Distributed Chemicals in a Water-Saturated Sorbing Porous Medium: 4. Distributions,
W75-10632 5B

BOLAND, R. A. JR.
Evaluation of Disposal Areas in James River; Hydraulic Model Investigation,
W75-10669 8B

BOMBA, J. G.
Pipeline Stress Analysis,
W75-10824 8B

BONER, F. C.
Temperatures of Wyoming Streams,
W75-10604 7C

BONHAM, A. J.
Valley Design in Urban Growth Centres,
W75-10643 6B

BOOKHOUT, C. G.
Effects of Mirex on the Larval Development of Blue Crab,
W75-10410 5C

BORNE, J.
The Consequences of Accepting Industrial Wastes into Sewers; Water Pollution Research at Stevenage,
W75-10842 5D

BORTHWICK, P. W.
A Gravity-Flow Column to Provide Pesticide-Laden Water for Aquatic Bioassays,
W75-10844 5A

BOTZLER, R. G.
Listeria in Aquatic Animals,
W75-10375 2I

BOVIS, M. J.
A Climatological Analysis of North Polar Desert Areas,
W75-10455 2C

BOYLE, W. C.
Treatability of Leachate from Sanitary Landfills,
W75-10683 5D

BRENCHLEY, D. L.
Environmental Problems Associated with the Use of Cooling Towers,
W75-10671 5D

BRIDBORD, K.
Health Implications of Exposure to Trace Metals from Combustion of Waste Oil,
W75-10765 5C

BRIGGS, R. E.
Some Effects of Field Weathering of Seed Cotton in a Desert Environment,
W75-10557 3F

BRINK, G. E.
Land Use Simulation Model of the Subalpine Coniferous Forest Zone,
W75-10404 3B

BRIONES, A. M.
Phosphorus Availability of Some Philippine Rice Soils as Affected by Soil and Water Management Practices,
W75-10421 3F

BROADHURST, W. L.
Summary Appraisals of the Nation's Ground-Water Resources--Rio Grande Region,
W75-10597 4B

BROCK, T. D.
Environmental Limitations on the Microbial Degradation of Hydrocarbons in Temperate Lakes,
W75-10407 5C

BROECKER, W. S.
Floating Glacial Ice Caps in the Arctic Ocean,
W75-10533 2C

BROOKS, R. B.
Heat Treatment of Sewage Sludges,
W75-10644 5D

BROWN, D. A.
Effects of Acute Exposure to Bleached Kraft Pulp Mill Effluent on Carbohydrate Metabolism of Juvenile Coho Salmon (Oncorhynchus Kisutch) During Rest and Exercise,
W75-10388 5C

BROWN, L. A.
Environmental Issues, Effects, and Solutions,
W75-10795 6G

BROWN, S. F.
Color Removal From Bleached Kraft Effluents,
W75-10399 5D

BRYANT, K. A. JR.
New Concepts in Suburban Drainage in Florida,
W75-10793 4A

BUCKS, D. A.
Trickle Irrigation Design Requirements for Row Crops,
W75-10801 3F

BURGES, S. J.
Use of Autoregressive Runoff Models in Reservoir Studies,
W75-10523 2E

BUSTARD, D. R.
Aspects of the Winter Ecology of Juvenile Coho Salmon (Oncorhynchus Kisutch) and Steelhead Trout (Salmo Gairdneri),
W75-10615 5C

BUTLER, H. L.
A Numerical Model for Predicting the Effects of Landslide-Generated Water Waves,
W75-10661 8A

BUXTON, D. R.
Some Effects of Field Weathering of Seed Cotton in a Desert Environment,
W75-10557 3F

BYRNE, R. J.
Wave Climate Model of the Mid-Atlantic Shelf and Shoreline (Virginian Sea), Model Development, Shelf Geomorphology, and Preliminary Results,
W75-10552 2L

CAIRNS, J. JR.
Response of Freshwater Protozoan Artificial Communities to Metals,
W75-10440 5C

CALHOUN, C. A.
Current Water Systems Automation Research and Development in the Bureau of Reclamation,
W75-10787 8C

CAMERON, R. E.
Application of Low-Latitude Microbial Ecology to High-Latitude Deserts,
W75-10459 2C

CAMPBELL, G. S.
The Effect of Prolonged Exposure to Elevated Temperatures on the Biochemical Constituents, Gonadal Development and Shell Deposition of the American Oyster, Crassostrea Virginica,
W75-10849 5C

CARLSON, E. J.
Change in Quality of Pumped Drainage Effluent,
W75-10779 5B

CARPENE, E.
Residues of Polychlorinated Biphenyls (PCB) and Chlorinated Pesticides in Fish and Birds of the Po Delta, (Residus de Polychlorobiphenyls (PCB) et de Pesticides Chlores Dans Les Poissons et Les Oiseaux du Delta du Po),
W75-10446 5B

CARRIERO, G.
Experience with the IFP Propane Clarification Process in Re-Refining Spent Crankcase Oils,
W75-10759 5D

CARSON, W. G.
Thallium: Occurrence in the Environment and Toxicity to Fish,
W75-10449 5C

CARSON, W. V.
Thallium: Occurrence in the Environment and Toxicity to Fish,
W75-10449 5C

CARTER, R. C.
Waste Lubricating Oil Characteristics--Do They Vary Geographically, Seasonally, and With Origin,
W75-10746 5B

CAULFIELD, H. P. JR.
Towards a Sharper Concept of an Action Variable,
W75-10813 6A

CHAMBERLAIN, A. R.
Role of the Public in Weather Modification,
W75-10777 3B

CHAMBERLIN, T. A.
Color Removal From Bleached Kraft Effluents,
W75-10399 5D

CHANDLER, J. H.
Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) To Nontarget Fish in Flow- Through Tests,
W75-10702 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) to Selected Aquatic Invertebrates and Frog Larvae,
W75-10703 5C

CHANG, J. H.
Laboratory Measurement of Surface Temperature Fluctuations Induced by Small Amplitude Surface Waves,
W75-10505 2L

CHANSKY, S.
Waste Automotive Lubricating Oil as a Municipal Incinerator Fuel,
W75-10764 5D

CHAPMAN, W. H.
Air and Water Pollution Control,
W75-10732 5D

CHARLEY, R. W.
Groundwater Model as a Tool in Planning and Management,
W75-10781 4B

CHAWLA, R.
Some Features of Tsunamis on the Pacific Coast of South and North America,
W75-10554 2L

CHEE, L.
Evaluation of Ground Water Resources: Sacramento County,
W75-10546 2F

CHEONG, H. F.
Dispersion of Contaminated Bedload Particles,
W75-10526 5B

CHESTER, R.
Average Trace Element Composition of Low Level Marine Atmospheric Particulates,
W75-10477 5B

CHILDERS, J. M.
Channel Erosion Surveys Along Southern Segment of the Taps Route, Alaska, 1972 and 1973,
W75-10594 8B

CHILDERS, W. F.
Uptake of Three Polychlorinated Biphenyls, DDT and DDE by the Green Sunfish, Lepomis Cyanellus Raf.,
W75-10422 5C

CHIZHOV, S. V.
Problems of Space Biology. Volume 24. The Water Supply of Spacecraft Crews,
W75-10365 5D

CHRISTIANSEN, J. E.
Effect of Agricultural Use on Water Quality for Downstream Use for Irrigation,
W75-10805 5G

CHRISTY, D.
Users' View of Weather Modification,
W75-10776 3B

CLABORN, B. J.
Statistical Model of Short-Duration Precipitation Events,
W75-10529 2B

CLAGUE, J. J.
Glacier-Flow Patterns and the Origin of Late Wisconsinan Till in the Southern Rocky Mountain Trench, British Columbia,
W75-10539 2C

CLARK, A. C. K.
Shipyard Problems with Oily Wastes,
W75-10753 5B

CLOUD, T. J. JR.
The Drift of Mayflies (Ephemeroptera) in the Brazos River, Texas,
W75-10558 5B

COACHMAN, L. K.
Toward an Ice-Free Arctic Ocean,
W75-10532 2C

COLEMAN, G. A.
Sediment-Yield Characteristics from Unit Source Watersheds,
W75-10848 2J

COLLINS, L. A.
Additional Studies of the Fishes, Macroinvertebrates and Hydrological Conditions of Upland Canals in Tampa Bay, Florida,
W75-10617 5C

COLUCCI, A.
Health Implications of Exposure to Trace Metals from Combustion of Waste Oil,
W75-10765 5C

COMPTE, A.
Experience with the IFP Propane Clarification Process in Re-Refining Spent Crankcase Oils,
W75-10759 5D

CONDIT, P. JR.
Oil and Debris Removal Unit,
W75-10726 5G

COOK, P. L.
Manual for Preparation of Environmental Impact Statements for Wastewater Treatment Works, Facilities Plans, and 208 Areawide Waste Treatment Management Plans,
W75-10473 5D

COREY, D. L.
Massachusetts Waste Oil Management Activities,
W75-10763 5D

CORTESI, P.
Residues of Polychlorinated Biphenyls (PCB) and Chlorinated Pesticides in Fish and Birds of the Po Delta, (Residus de Polychlorobiphenyls (PCB) et de Pesticides Chlores Dans Les Poissons et Les Oiseaux du Delta du Po),
W75-10446 5B

COSNER, O. J.
A Predictive Computer Model of the Lower Cretaceous Aquifer, Franklin Area, Southeastern Virginia,
W75-10599 2F

COSTLOW, J. D. JR.
Effects of Mirex on the Larval Development of Blue Crab,
W75-10410 5C

COUES, W. P.
Financing Water Works,
W75-10712 3D

COWAN, A. B.
Listeria in Aquatic Animals,
W75-10375 2I

CRAWFORD, D. L.
Production of Microbial Protein From Waste Cellulose by Thermomonospora Fusca, A Thermophilic Actinomycete,
W75-10538 5C

CREASE, R. I.
Hydraulic Behaviour of the Chalk Aquifer in the Yorkshire Wolds,
W75-10506 4B

CRISETIG, G.
Residues of Polychlorinated Biphenyls (PCB) and Chlorinated Pesticides in Fish and Birds of the Po Delta, (Residus de Polychlorobiphenyls (PCB) et de Pesticides Chlores Dans Les Poissons et Les Oiseaux du Delta du Po),
W75-10446 5B

CRONIN, N.
Manual for Preparation of Environmental Impact Statements for Wastewater Treatment Works, Facilities Plans, and 208 Areawide Waste Treatment Management Plans,
W75-10473 5D

CROSBY, L. G.
Los Angeles and Long Beach Harbors Model Study; Report 2, Observations of Ship Mooring and Movement,
W75-10664 8B

CULLEN, G. V.
Removal of Pollutants from Water,
W75-10736 5D

CULLEY, D. D. JR.
The Effects of Crude Oil on the Palatability of Marine Crustaceans,
W75-10428 5C

CURRY, N. A.
Guidelines for Landfill of Toxic Industrial Sludges,
W75-10487 5G

CUTLER, J. M.
Characterization of Cadmium Uptake by Plant Tissue,
W75-10479 5B

D'ARGE, R. C.
Methodological Application of the Straw Man Decision Structure to a Hypothetical Case: The Dorfman-Jacoby Water Quality Model,
W75-10811 6A

DAI, T. S.
Measurement of Hydraulic Conductivity of Peats,
W75-10536 7B

DALTON, T.
Containment, Collection and Recycling of Oily Wastes,
W75-10747 5G

DARWAZEH, H. A.
Biological Activity of Organophosphorus Compounds and Synthetic Pyrethroids Against Immature Mosquitoes,
W75-10631 5G

DAVENPORT, J. T.
Towards a Sharper Concept of an Action Variable,
W75-10813 6A

DAVIDSON, D. D.
Lake Erie International Jetport Model Feasibility Investigation, Physical Model Feasibility Study,
W75-10670 8B

DAVIES, W. E.
Geological and Limnological Factors of Cold Deserts,
W75-10457 2C

DAVIS, A. R.
A Remote Sensing Laser Fluorometer,
W75-10831 5A

DAVIS, C. H.
Effect of a Phytoplankton Culture on the Germination and Seedling Development of Barley, Sugar Beets and Lettuce,
W75-10496 3F

DAVIS, D. W.
Optimal Sizing of Urban Flood-Control Systems,
W75-10821 4A

DAVIS, E. M.
Biological Bases for Water Quality Standards,
W75-10677 5G

DAY, C. L.
Prediction of Trifluralin Diffusion Coefficients,
W75-10542 5B

DEAL, R. B.
General Aspects of Multivariate Analysis with Applications to Some Problems in Hydrology,
W75-10510 2A

DEAN, H. J.
Toxicity of Two Synthetic Pyrethrins to Brown Trout,
W75-10438 5C

DEBOER, J. G.
Five Year Study of Des Moines River Water Quality,
W75-10803 5B

DECOURSEY, D. G.
General Aspects of Multivariate Analysis with Applications to Some Problems in Hydrology,
W75-10510 2A

DEFOE, D. L.
Multichannel Toxicant Injection System for Flow-Through Bioassays,
W75-10443 5A

DELEVAUX, M. H.
Uranium, Thorium, and Lead Concentrations in Three Silicate Standards and a Method of Lead Isotopic Analysis,
W75-10494 2K

DELLEUR, J. W.
Removal of Periodicities by Differencing and Monthyl Mean Subtraction,
W75-10352 2A

DEMICHELE, D. W.
An Analysis of the Mechanics of Guard Cell Motion,
W75-10488 2I

DENNY, J. L.
Statistical Inference on Streamflow Processes with Markovian Characteristics,
W75-10525 2E

DESAIAH, D.
Inhibition of ATPases Acitivity in Channel Catfish Brain by Kepone(Trade Name) and its Reduction Product,
W75-10612 5C

DEVRIES, J. J.
Some Factors Affecting Control of Flow in a Large Canal System,
W75-10786 8B

DICK, R. I.
Waste Water Treatment: Sludge Treatment, Utilization, and Disposal,
W75-10395 5D

DOBBS, T. L.
Analyzing Reimbursement Mechanisms for Resource Development Projects,
W75-10353 6C

DOERING, E. J.
Drainage Analysis of a Confining Formation,
W75-10780 4A

DOLEZAL, J.
Atomic Absorption Spectrometric Determination of Cadmium, Lead, Silver, Thallium and Zinc in Silicate Rocks by Direct Atomization From the Solid State,
W75-10492 2K

DONALDSON, E. M.
Corticosteroid Concentrations in Sockeye Salmon (Oncorhynchus Nerka) Exposed to Low Concentrations of Copper,
W75-10415 5C

DOUGLAS, I.
Flood Waves and Suspended Sediment Pulses in Urbanized Catchments,
W75-10647 4C

DOVE, F. H.
Methodological Problems in Applying the Straw Man to Real Life Problems,
W75-10814 6A

DOWELL, C. O.
Derivation of Reservoir Operating Rules by Economic Analysis,
W75-10825 4A

DRAGOUN, F. J.
Groundwater Control by Pumping,
W75-10778 4B

DREW, W. M.
The Mutual Destruction of Polluting Factors in Waste Liquors,
W75-10645 5D

DUCKSTEIN, L.
An Event-Based Stochastic Model of Areal Rainfall and Runoff,
W75-10521 2B

DUERR, A. D.
Hydrological Data From Wells in Southwest Hillsborough County, Florida, 1950-74,
W75-10593 7C

DURHAM, D. L.
Lake Erie International Jetport Model Feasibility Investigation, Physical Model Feasibility Study,
W75-10670 8B

Los Angeles and Long Beach Harbors Model Study; Report 2, Observations of Ship Mooring and Movement,
W75-10664 8B

DYE, H. M.
Corticosteroid Concentrations in Sockeye Salmon (Oncorhynchus Nerka) Exposed to Low Concentrations of Copper,
W75-10415 5C

EBINA, S.
Water Quality Factors in Designing a Sewage Plant Based on Public Drainage Statistical Data, (In Japanese),
W75-10838 5D

EDBERG, N.
Cellulose Degradation in Waste Water Treatment,
W75-10376 5D

EDLUND, S.
Stockholm Puts Sewage Plants Underground,
W75-10718 5D

EDWARDS, A. B.
Deterioration of Water Quality in Distribution Systems,
W75-10711 5F

EICHELMANN, J. F. JR.
Air and Water Pollution Control,
W75-10732 5D

ENGLISH, J. N.
Waste Water Treatment: Water Reclamation and Reuse,
W75-10372 5D

ERICSEN, R. G.
Automation of an Existing Irrigation System - Part I,
W75-10788 8C

ESHWAR, M. C.
Rapid Extractive Spectrophotometric Determination of Gold (III) With 4-(2-Pyridylazo)-Resorcinol,
W75-10499 2K

ETNIER, D. A.
Fishes of the Hiwassee River System: Ecological and Taxonomic Considerations,
W75-10694 5C

EVANS, C. A. JR.
Toxic Trace Elements: Preferential Concentration in Respirable Particles,
W75-10482 5A

EVANS, J. C. W.
Taio Paper (Company, Iyomishima, Japan) Expands to 1,000,000 Tons/Year,
W75-10380 5D

EVERETT, W. L.
Methodological Problems in Applying the Straw Man to Real Life Problems,
W75-10814 6A

EVERS, R. H.
Water-Quality Requirements for the Petroleum Industry,
W75-10465 5D

EWALT, R. E.
Operational Value of Weather Information in Relation to Soil Management Characteristics,
W75-10367 2G

EYCHANER, J. H.
Ground-Water Conditions in Utah, Spring of 1975,
W75-10506 2F

FABLE, W. A. JR.
Additional Studies of the Fishes, Macroinvertebrates and Hydrological Conditions of Upland Canals in Tampa Bay, Florida,
W75-10617 5C

FABRIS, G. J.
Trace Elements in Melbourne Rivers - An Interlaboratory Analysis,
W75-10649 5A

FARGERLUND, U. H. M.
Acute Toxicity of Kanamycin to Steelhead Trout (Salmo Gairdneri),
W75-10423 5C

FARNAN, R. A.
Waste Water Treatment: Land Disposal of Waste Water,
W75-10373 5E

FELDMAN, S. L.
On the Peak-Load Pricing of Urban Water Supply,
W75-10706 6C

FENG, S. Y.
The Effect of Prolonged Exposure to Elevated Temperatures on the Biochemical Constituents, Gonadal Development and Shell Deposition of the American Oyster, Crassostrea Virginica,
W75-10849 5C

FIELD, R.
Coping With Urban Runoff in the United States,
W75-10541 5D

FINLEY, H. E.
Population Dynamics of Protozoa in Wastewater, and Impact of Environmental Changes,
W75-10689 5D

FISCHER, R. A.
Flooding and Soil Temperature Effects on Wheat During Grain Filling,
W75-10829 3F

FISH, R. E.
Report on the River Master of the Delaware River for the Period December 1, 1973-November 30, 1974,
W75-10589 4A

FISHER, N. S.
Effects of Chlorinated Hydrocarbon Pollutants on Growth of Marine Phytoplankton in Culture,
W75-10636 5C

FLETCHER, B. P.
Spillway for Burnsville Dam, Little Kanawha River, West Virginia; Hydraulic Model Investigation,
W75-10665 8B

FLETCHER, G. L.
Copper, Zinc and Total Protein Levels in the Plasma of Sockeye Salmon (Oncorhynchus Nerka) During Their Spawning Migration,
W75-10613 5C

FLETCHER, R.
A Connectives Model Relating Water Policy Action Variables to Recreational Opportunity Social Indicators,
W75-10819 6A

FOGEL, M. M.
An Event-Based Stochastic Model of Areal Rainfall and Runoff,
W75-10521 2B

FOLLMER, S.
Methodological Application of the Straw Man Decision Structure to a Hypothetical Case: The Dorfman-Jacoby Water Quality Model,
W75-10811 6A

FONTANE, D. G.
Statistical Tolerance Limits for a Pearson Type III Distribution,
W75-10511 2E

FORD, R. S.
Evaluation of Ground Water Resources: Sacramento County,
W75-10546 2F

FORDHAM, J. W.
Multisite Streamflow Simulation of Truckee River, Nevada,
W75-10509 2E

FORESTER, J.
A Gravity-Flow Column to Provide Pesticide-Laden Water for Aquatic Bioassays,
W75-10844 5A

FOSTER, S. S. D.
Hydraulic Behaviour of the Chalk Aquifer in the Yorkshire Wolds,
W75-10506 4B

FOXWORTHY, B. L.
Flood Hazards in the Seattle-Tacoma Urban Complex and Adjacent Areas, Washington,
W75-10580 7C

FRANCO, J. J.
Navigation Conditions at Cannelton Locks and Dam, Ohio River; Hydraulic Model Investigation,
W75-10667 8B

FRANZ, D. D.
Hourly Rainfall Generation for a Network,
W75-10515 2B

FREESTONE, F. J.
Runoff of Oils from Rural Roads Treated to Suppress Dust,
W75-10766 5B

FREMLING, C. R.
Acute Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitro-Phenol (TFM) to Nymphs of Mayflies (Hexagenia Sp.),
W75-10699 5C

FRERE, M. H.
ACTMO, An Agricultural Chemical Transport Model,
W75-10846 5B

FRIBERG, T. S.
Organic Compounds in Pulp Mill Lagoon Discharge,
W75-10402 5D

FRISA, C. N.
Toxicity of Two Synthetic Pyrethrins to Brown Trout,
W75-10438 5C

FRY, R. G.
Evaluation of Agricultural Drainage in Water Quality Management,
W75-10796 5G

FUJINO, O.
Determination of Manganese in Natural Waters by Atomic Absortion Spectrometry with a Carbon Tube Atomizer,
W75-10386 5A

FUKUYAMA, Y.
Method of Treating Aluminum-Containing Waste Water,
W75-10730 5D

FULLER, R. H.
Problems Related to Water Quality and Algal Control in Lopez Reservoir, San Luis Obispo County, California,
W75-10601 5B

FURUTA, M.
Method of Purification of Waste Water Produced From the Packing of Meat and Aquatic Animals,
W75-10737 5D

GAGNON, C. R.
Computer Simulation of Water Distribution Networks,
W75-10823 4A

GAL'PER, G. E.
Instruction for Record Keeping of Water Consumption at the Enterprises of the Paper Industry (Instruktsiya ucheta raskhoda vody na predpriyatiyakh otrasli),
W75-10370 3E

GALICIA, F.
Oil Separation and Recovery Device,
W75-10728 5G

GARY, H. L.
Canopy Weight Distribution Affects Windspeed and Temperature in a Lodgepole Pine Forest,
W75-10654 4A

Watershed Management Problems and Opportunities for the Colorado Front Range Ponderosa Pine Zone: The Status of Our Knowledge,
W75-10655 4D

GAUL, D.
Investigations on the Production of Hygienic Compost from Air-Dried Sewage Using Different Additives (Versuche zur Herstellung von hygienisch einwandfreiem Kompost aus luftgetrocknetem Faulschlamm unter Verwendung verschiedener Zusaetze),
W75-10834 5D

GEBHARDT, M. R.
Prediction of Trifluralin Diffusion Coefficients,
W75-10542 5B

GEISER, H.
Groundwater Protection in Highway Construction in the Catchment Area of the City of Berne at Kiesen (Grundwasserschutz beim Autobahn im Fassungsgebiet Stadt Bern in Kiesen),
W75-10837 5C

GEISSEL, L. D.
Toxicity of the Lampricide 3-Trifluoromethyl-4-nitrophenol (TFM) to 10 Species of Algae,
W75-10697 5C

GELLMAN, I.
Industrial Wastes: Paper and Allied Products,
W75-10397 5D

GENYS, J. B.
Daily Temperature and Salinity of Surface Water of Patuxent River at Solomons, Maryland, Based on 30 Years of Records (1938-1967),
W75-10535 2E

GERNER, D. L.
Redistribution and Concentration of Mercury in the Environment,
W75-10483 5B

GILFILLAN, E. S.
Decrease of Net Carbon Flux in Two Species of Mussels Caused by Extracts of Crude Oil,
W75-10433 5C

GILMARTIN, M.
The Concentration of Mercury, Copper, Nickel, Silver, Cadmium and Lead in the Northern Adriatic Anchovy, Engraulis Encrasicholus, and Sardine, Sardina Pilchardus,
W75-10620 5B

GIOVINETTO, M. B.
Some Aspects of Climatology in Polar Barrens,
W75-10454 2C

GODFREY, K. A. JR.
Land Treatment of Municipal Sewage,
W75-10719 5D

GOERING, C. E.
Prediction of Trifluralin Diffusion Coefficients,
W75-10542 5B

GOLDMAN, C. R.
Suppression of Nitrogen Fixation by Blue-Green Alage in a Eutrophic Lake with Trace Additions of Copper,
W75-10480 5C

GOLDSMITH, V.
Wave Climate Model of the Mid-Atlantic Shelf and Shoreline (Virginian Sea), Model Development, Shelf Geomorphology, and Preliminary Results,
W75-10552 2L

GOVE, G. W.
Industrial Wastes: Paper and Allied Products,
W75-10397 5D

GRAHN, O.
Toxic Effects of Aliphatic Chlorinated by-Products from Vinyl Chloride Production on Marine Animals,
W75-10412 5C

GRANADE, J. W.
The Economic Impact of Mercury Pollution on Fisheries and Other Related Businesses Around Pickwick Lake,
W75-10356 5G

GRANT, L. O.
Priority Problems for Modifying Cumulus Precipitation,
W75-10774 3B

GRANT, M. G.
The Navy's Oily Wastes Handling and Disposal Program,
W75-10750 5D

GREB, B. W.
Protein Content of Winter Wheat Grain as Related to Soil and Climatic Factors in the Semi-Arid Central Great Plains,
W75-10792 3F

GRIZZARD, T. J.
Will Wastewater Treatment Stop Eutrophication of Impoundments,
W75-10686 5D

GROSS, H. G.
A Remote Sensing Laser Fluorometer,
W75-10831 5A

GULABI, M.
Fast Separation of Tin (IV) From Tin (II) and From Numerous Metal Ions on Ion-Exchange Papers,
W75-10497 2K

GUMTZ, G. D.
Pollution Control with a Comprehensive Waste Oil Processing Plant,
W75-10758 5D

GUPTA, V. L.
Multisite Streamflow Simulation of Truckee River, Nevada,
W75-10509 2E

HAISE, H. R.
Effectiveness of Precipitation in a Mountain Meadow,
W75-10799 2D

HALLOCK, R. V.
Treatment of Milk Truck Washing Wastes by Anerobic Digestion,
W75-10673 5D

HALPENNY, L. C.
Utilization of Sewage Effluent for Irrigation,
W75-10798 5D

HAM, R. K.
Treatability of Leachate from Sanitary Landfills,
W75-10683 5D

HAMAGUCHI, A.
Physiological Changes in the Serum and Hepatopancreas of Yellow Tail Injected with Carbon Tetrachloride, (In Japanese),
W75-10630 5C

HAMDY, M. Y.
Sludge Disposal on Agricultural Soil,
W75-10674 5D

HAMILTON, R. S.
Concentration of Dilute Waste Streams by Ion Exchange Techniques,
W75-10672 5D

HAMMER, D. I.
Health Implications of Exposure to Trace Metals from Combustion of Waste Oil,
W75-10765 5C

HAMPTON, B. B.
Hydrologic Data for Urban Studies in the Fort Worth, Texas Metropolitan Area, 1973,
W75-10596 7C

HAMRICK, R. L.
A Stochastic Model for Daily Rainfall Data Synthesis,
W75-10518 2B

HANAMI, Y.
Method of Treating Aluminum-Containing Waste Water,
W75-10730 5D

HANDMAN, E. H.
Hydrogeologic Data for the Farmington River Basin, Connecticut,
W75-10591 7C

HANKE, S. H.
Water Rates: An Assessment of Current Issues,
W75-10707 6C

HANN, R. W. JR.
Effects of an Offshore Crude Oil Unloading Terminal on the Marine Environment,
W75-10642 5C

HANSEN, C. R. JR.
Acute Toxicities of 3-Trifluoromethyl-4-Nitrophenol (TFM) and 2',5-Dichloro-4'-Nitrosalicylanilide (Bayer 73) to Larvae of the Midge (Chironomus Tentans),
W75-10698 5C

HANSSEN, J. E.
Atomic Absorption Spectrometric Determination of Cadmium, Lead, Silver, Thallium and Zinc in Silicate Rocks by Direct Atomization From the Solid State,
W75-10492 2K

HARKIN, J. M.
Production of Microbial Protein From Waste Cellulose by Thermomonospora Fusca, A Thermophilic Actinomycete,
W75-10538 5C

HARMS, U.
Determination of the Transition Metals Manganese, Iron, Cobalt, Copper and Zinc in River Fishes With Help of X-Ray Fluorescence Analysis and Flameless Atomic Absorption Spectroscopy, (Bestimmung der Ubergangsmetalle Mangan, Eisen, Kobalt, Kupfer und zink in

Flussfischen mit Hilfe der Rontgenfluores-zenzanalyse und der flammenlosen Atomabsorption),
W75-10408 5A

On the Accumulation of Organochlorine Pesticides, PCB and Certain Heavy Metals in Fish and Shellfish from Thai Coastal and Inland Waters,
W75-10616 5B

HARRAH, D.
Comments on the Straw Man,
W75-10808 6B

HARRINGTON, A.
A Criterion for Vegetation Stiffness,
W75-10782 4A

HARRIS, J. E.
Trace Elements in Melbourne Rivers - An Interlaboratory Analysis,
W75-10649 5A

HART, F. L.
An Evaluation of Persistency for Water Borne Organics,
W75-10850 5B

HASH, L.
Deterioration of Water Quality in Distribution Systems,
W75-10711 5F

HATANAKA, M.
Experimental Investigation on the Biological Concentration of Mercury-I. On the Rate of Mercury Transfer Through the Food Chain From Jack Mackerel to Young Yellowtail (In Japanese),
W75-10441 5C

HATCHER, R. F.
Enrichment of Surface Freshwater Microlayers with Algae,
W75-10583 5A

HAWKINS, R. H.
A Note on Mixed Distributions in Hydrology,
W75-10527 2E

HEATH, A. C.
The Effect of Sublethal Concentrations of Copper and Zinc on Ventilatory Activity, Blood Oxygen, and pH in Rainbow Trout (Salmo Gairdneri),
W75-10624 5C

HEATH, R. C.
Hydrology of the Albemarle-Pamlico Region, North Carolina--A Preliminary Report on the Impact of Agricultural Developments,
W75-10602 4C

HECKROTH, C. W.
P. L. 92-500 (Two Years Later) is Not the Answer,
W75-10471 5G

HEINZ, G.
Effects of Methylmercury on Approach and Avoidance Behavior of Mallard Ducklings,
W75-10424 5C

HELFGOTT, T.
An Evaluation of Persistency for Water Borne Organics,
W75-10850 5B

HELVEY, J. D.
Watershed Behavior After Forest Fire in Washington,
W75-10790 4C

HENRY, C.
Disposal of Digested Sewage Sludge by Landfill,
W75-10682 5D

HERSHFIELD, D. M.
Cross Spectra of Short-Duration Rainfall,
W75-10514 2B

HEUSS, K.
X-ray Microanalysis of Zinc and Iron in the Cheloride Cells of Mayfly Larvae of the River Sulz, (Rontgenmikroanalyse von Zink und Eisen in Chloridzellen von Eintagsfligenlarven aus der Sulz),
W75-10416 5A

HIGGINS, J. M. JR.
The Effect of Landowner Attitude on the Financial and the Economic Costs of Acquiring Land for a Large Public Works Project,
W75-10827 6B

HINES, W. G.
Problems Related to Water Quality and Algal Control in Lopez Reservoir, San Luis Obispo County, California,
W75-10601 5B

HIROSAWA, K.
Electron Microscope Autoradiography of Kidney After Administration of PB-210 in Mice,
W75-10476 5A

HITCH, R. K.
Fishes of the Hiwassee River System: Ecological and Taxonomic Considerations,
W75-10694 5C

HODSON, P. V.
Temperature-Induced Changes in Acute Toxicity of Zinc to Atlantic Salmon (Salmo salar),
W75-10431 5C

HOEFT, M. J.
Results of Airblast Overpressure Measurement Program at Project R.D. Bailey,
W75-10555 8H

HOFSTEN, B. V.
Cellulose Degradation in Waste Water Treatment,
W75-10376 5D

HOGAN, C.
Water Reuse in a Paper Reprocessing Plant,
W75-10401 5D

HOLLAND, A. C.
Error Analysis of Dobson Spectrophotometer Measurements of the Total Atmospheric Ozone Content,
W75-10545 7B

HOLLIS, G. E.
The Effects of Urbanization on Floods of Different Recurrence Interval,
W75-10709 4C

HOLTAN, H. N.
ACTMO, An Agricultural Chemical Transport Model,
W75-10846 5B

HOPKINS, H. T.
Hydrogeologic Data for the Farmington River Basin, Connecticut,
W75-10591 7C

HORNE, A. J.
Suppression of Nitrogen Fixation by Blue-Green Alage in a Eutrophic Lake with Trace Additions of Copper,
W75-10480 5C

HOWARD, T. E.
Swimming Performance of Juvenile Coho Salmon (Oncorhynchus Kisutch) Exposed to Bleached Kraft Pulp Mill Effluent,
W75-10387 5C

HOWES, D.
Absorption, Metabolism, and Excretion by Goldfish of the Anionic Detergent Sodium Lauryl Sulphate,
W75-10626 5C

Effect of Water Hardness on the Toxicity of a Nonionic Detergent to Fish,
W75-10444 5C

HRUTFIORD, B. F.
Organic Compounds in Pulp Mill Lagoon Discharge,
W75-10402 5D

HUANG, Y. W.
Effects of Heavy Metals and Pesticides on the Mass Mortalities of Cultured Shellfishes Along the Southwest Coast of Taiwan, (In Chinese),
W75-10427 5C

Heavy Metal Contents of Fishes Caught in Kaohsiung Harbor, (In Chinese),
W75-10430 5A

HUDSON, J. D.
Ground-Water Levels in New Mexico, 1972,
W75-10582 4B

HUFF, C. E.
Analyzing Reimbursement Mechanisms for Resource Development Projects,
W75-10353 6C

HUGHES, D. A.
The Toxicity of Heavy Metal Ions to Anaerobic Digestion,
W75-10843 5D

HUNG, C. S.
Research in Stochastic Models for Bedload Transport,
W75-10522 2J

HUSAIN, W.
Fast Separation of Tin (IV) From Tin (II) and From Numerous Metal Ions on Ion-Exchange Papers,
W75-10497 2K

HUSCHENBETH, E.
On the Accumulation of Organochlorine Pesticides, PCB and Certain Heavy Metals in Fish and Shellfish from Thai Coastal and Inland Waters,
W75-10616 5B

HUTCHESON, M. S.
The Effect of Temperature and Salinity on Cadmium Uptake by the Blue Crab, Callinectes sapidus,
W75-10448 5C

ISHIZAKI, T.
Color of Pulp Industry Waste Liquors. (6). Behavior of Color During Waste Treatments (In Japanese),
W75-10393 5D

ITOYAMA, T.
Water Analysis of River Waters in Kagawa (IX), Chemical Composition of the Aya Water Basin, (In Japanese),
W75-10841 2K

JACOBSEN, G.
Resource Development in Canada's High Arctic,
W75-10463 2C

JACOBY, S. L. S.
Computer Simulation of Water Distribution Networks,
W75-10823 4A

JAKOBSON, K.
Waste Oil Management--The Environmental Protection Agency's Role,
W75-10742 5G

JAKSCH, J. A.
The Waste Oil Industry: A Discussion of Some Issues to Consider in Performing an Economic Analysis,
W75-10767 5G

JAMES, W. P.
Effects of an Offshore Crude Oil Unloading Terminal on the Marine Environment,
W75-10642 5C

JENG, S. S.
Effects of Heavy Metals and Pesticides on the Mass Mortalities of Cultured Shellfishes Along the Southwest Coast of Taiwan, (In Chinese),
W75-10427 5C

Heavy Metal Contents of Fishes Caught in Kaohsiung Harbor, (In Chinese),
W75-10430 5A

JENKINS, W.
A Method of Disaggregation,
W75-10817 6A

JENNELLE, E. M.
Will Wastewater Treatment Stop Eutrophication of Impoundments,
W75-10686 5D

JENNINGS, F. D.
International Exploration Locates Minerals and Oils,
W75-10467 5B

JEWETT, G.
Egalitarianism,
W75-10818 6A

JOHANSSON, L.
Toxic Effects of Aliphatic Chlorinated by-Products from Vinyl Chloride Production on Marine Animals,
W75-10412 5C

JOHNSON, H. E.
Toxicity of the Lampricide 3-Trifluoromethyl-4-nitrophenol (TFM) to 10 Species of Algae,
W75-10697 5C

JONES, K. M.
Icebreaking Drillship for Offshore Exploratory Drilling in the Arctic,
W75-10639 5G

JONES, P.
Production of Microbial Protein From Waste Cellulose by Thermomonospora Fusca, A Thermophilic Actinomycete,
W75-10538 5C

JOSEPH, E. S.
Recurrence Intervals of Annual Minimum Streamflows,
W75-10530 2E

JUDGE, R. M.
Methodological Problems in Applying the Straw Man to Real Life Problems,
W75-10814 6A

JUDSON, A.
Avalanche Warnings: Content and Dissemination,
W75-10653 2C

KACEW, S.
Persistence of Cadmium-Induced Metabolic Changes in Liver and Kidney,
W75-10478 5A

KACHEL, W. M.
Reclamation of Textile Printing Wastewaters for Direct Recycle,
W75-10676 5D

KAGAN, R. S.
Stochastic Models of Spatial and Temporal Distribution of Thunderstorm Rainfall,
W75-10519 2B

KAJIYAMA, Y.
Process for Removing Heavy Metal Ions in Water,
W75-10731 5D

KAMIJO, H.
The Effect of the Quantity of Silt to the Attached Microorganisms of the Kuzuryu-Gawa River in the Hokuriku District, (In Japanese),
W75010696 5C

KARPEVICH, A. F.
The Effect of Different Salinities and Manganese Ion on the Survival Respiration of the Baltic Flounder (Pleuronectes Flesus Trachurus (Dunker)) of the Gulf of Riga,
W75-10411 5C

KAVVAS, M. L.
Removal of Periodicities by Differencing and Monthyl Mean Subtraction,
W75-10352 2A

KAWATSKI, J. A.
Acute Toxicities of 3-Trifluoromethyl-4-Nitrophenol (TFM) and 2',5-Dichloro-4'-Nitrosalicylanilide (Bayer 73) to Larvae of the Midge (Chironomus Tentans),
W75-10698 5C

Uptake, Elimination and Biotransformation of the Lampricide 3-Trifluromethyl-4-Nitrophenol (TFM) by Larvae of the Aquatic Midge Chironomus Tentans,
W75-10629 5C

KEINATH, T. M.
Reclamation of Textile Printing Wastewaters for Direct Recycle,
W75-10676 5D

KELSO, J. R. M.
Influence of a Thermal Effluent on Movement of Brown Bullhead (Ictalurus Nebulosus) as Determined by Ultrasonic Tracking,
W75-10628 5C

KENNEDY, J. F.
Hydraulics and Mechanics of River Ice Jams,
W75-10556 8B

KESTERSON, J. W.
Responses of 'Bearss' Lemon to Nitrogen, Potassium and Irrigation Applications,
W75-10714 3F

KHANAL, N. N.
A Stochastic Model for Daily Rainfall Data Synthesis,
W75-10518 2B

KIKUCHI, T.
Residue Analyses on 2-Amino-4 Phenylthiazole, a Piscine Anesthetic, in Fishes-I a Model Radio-Tracer Experiment with Medaka,
W75-10614 5A

KING, C. H. JR.
The Perimeter Canal - A New Approach to Discharge Urban Water into a Coastal Mangrove Area,
W75-10773 4A

KING, M. J.
Copper, Zinc and Total Protein Levels in the Plasma of Sockeye Salmon (Oncorhynchus Nerka) During Their Spawning Migration,
W75-10613 5C

KINNEY, E. T.
The Navy's Oily Wastes Handling and Disposal Program,
W75-10750 5D

KINOSHITA, K.
Determination of Manganese in Natural Waters by Atomic Absortion Spectrometry with a Carbon Tube Atomizer,
W75-10386 5A

KIRCHER, J. E.
Temperatures of Wyoming Streams,
W75-10604 7C

KIRK, B. S.
Multiple Cycle Process for Wastewater Purification,
W75-10738 5D

KISER, K. M.
Physical Model Study of Circulation Patterns in Lake Ontario,
W75-10537 2H

KISIEL, C. C.
Statistical Inference on Streamflow Processes with Markovian Characteristics,
W75-10525 2E

KITAGAWA, K.
Spectroscopic Determination of Atomization Efficiency (CuCl-Cu+Cl) in an Air-Hydrogen Flame,
W75-10498 2K

KLEMES, V.
Some Problems in Pure and Applied Stochastic Hydrology,
W75-10508 2A

KNAACK, D.
Studies on Possibilities of Biochemical Purification of Evaporator Condensate Occurring During Sulfite Pulp Manufacture (Untersuchungen ueber die Moeglichkeit der biochemischen Reinigung des bei der Sulfitzellstoffherstellung anfallenden Eindampfkondensates),
W75-10382 5D

KNAUF, N.
Devices for Toxicological Long-Term Studies on Aquatic Organisms (Gerate zur

Durchfuhrung Toxikologischer Langzeitstudien an Wasserorganismen),
W75-10618 5A

KNIEPER, L. H.
The Effects of Crude Oil on the Palatability of Marine Crustaceans,
W75-10428 5C

KNIGHT, R. J.
Uranium, Thorium, and Lead Concentrations in Three Silicate Standards and a Method of Lead Isotopic Analysis,
W75-10494 2K

KO, S. C.
Nuclear Power Plant Cooling System Selection,
W75-10822 6C

KOBAYASHI, K.
Studies on the Metabolism of Chlorophenols in Fish-I Absorption and Excretion of PCP by Goldfish,
W75-10417 5C

Studies on the Metabolism of Chlorophenols in Fish-II Turnover in Absorbed PCP in Goldfish,
W75-10418 5C

Studies on the Metabolism of Chlorophenols in Fish-III Isolation and Identification of a Conjugated PCP Excreted by Goldfish,
W75-10611 5A

KOBAYASHI, N.
Bioassay Data for Marine Pollution Using Sea Urchin Eggs, 1972 and 1973,
W75-10432 5A

Marine Pollution Bioassay by Sea Urchin Eggs, An Attempt to Enhance Accuracy,
W75-10419 5A

KOCH, R. B.
Inhibition of ATPases Acitivity in Channel Catfish Brain by Kepone(Trade Name) and its Reduction Product,
W75-10612 5C

KOEHLER, J. H.
Map of the Antelope Valley-East Kern Water Agency Area, California, Showing Ground-Water Subunits and Areas, Location of Wells, and Water-Level Contours for Spring 1974,
W75-10595 7C

KOLB, G. C.
Color Removal From Bleached Kraft Effluents,
W75-10399 5D

KONDO, T.
Color of Pulp Industry Waste Liquors. (6). Behavior of Color During Waste Treatments (In Japanese),
W75-10393 5D

Color of Pulp Industry Waste Liquors. (7). Color Reduction by Ultraviolet Treatment (In Japanese),
W75-10394 5D

KONTOGIANNIS, J. E.
The Effect of Crude Oil Fractions on the Survival of a Tidepool Copepod, Tigriopus Californicus,
W75-10641 5C

KOO, R. C. J.
Responses of 'Bearss' Lemon to Nitrogen, Potassium and Irrigation Applications,
W75-10714 3F

KOPPLE, J. D.
Lead Metabolism in the Normal Human: Stable Isotope Studies,
W75-10484 5A

KOPYLOV, V. A.
Increasing the Efficiency of Flotation Saveralls (Povyshenie effektivnosti raboty flotatsionnykh lovushek),
W75-10369 5D

KORKISCH, J.
Determination of Cadmium, Copper, and Lead in Natural Waters After Anion-Exchange Separation,
W75-10385 5A

KOUWEN, N.
A Criterion for Vegetation Stiffness,
W75-10782 4A

KRATKY, B. A.
Water-Soil-Plant Interactions with Terbacil,
W75-10486 5C

KRIDER, J. N.
New Concepts in Suburban Drainage in Florida,
W75-10793 4A

KROOP, R. H.
Disposal and/or Recycle of Air Force Waste Petroleum Oils and Lubricants,
W75-10749 5D

KRUSE, E. G.
Effectiveness of Precipitation in a Mountain Meadow,
W75-10799 2D

KRUUS, J.
A Remote Sensing Laser Fluorometer,
W75-10831 5A

KUGELMAN, I. J.
Waste Water Treatment: Water Reclamation and Reuse,
W75-10372 5D

KUIPER, D.
Domestic Waste Water Reuse--Aspects of the Treatment System,
W75-10708 5D

KWAIN, W-H.
Effects of Temperature on Development and Survival of Rainbow Trout, Salmo Gairdneri, in Acid Waters,
W75-10623 5C

LABELLA, S. A.
Treatment of Winery Wastes by Aerated Lagoon, Activated Sludge, and Rotating Biological Contractor,
W75-10685 5D

LACLAIR, L. M.
Integral Circular Wastewater Treatment Plant,
W75-10729 5D

LACY, A. W.
International Production Aspects of Water and Environmental Quality Control,
W75-10357 5G

LAIN, J. L.
Effects of Heavy Metals and Pesticides on the Mass Mortalities of Cultured Shellfishes Along the Southwest Coast of Taiwan, (In Chinese),
W75-10427 5C

Heavy Metal Contents of Fishes Caught in Kaohsiung Harbor, (In Chinese),
W75-10430 5A

LANCE, E. V.
Groundwater Model as a Tool in Planning and Management,
W75-10781 4B

LANDO, R.
Social Indicators and Connectives,
W75-10812 6A

LANE, L. J.
Stochastic Models of Spatial and Temporal Distribution of Thunderstorm Rainfall,
W75-10519 2B

LANGMYHR, F. J.
Atomic Absorption Spectrometric Determination of Cadmium, Lead, Silver, Thallium and Zinc in Silicate Rocks by Direct Atomization From the Solid State,
W75-10492 2K

Atomic-Absorption Spectrometric Determination of Copper, Lead, Cadmium and Manganese in Pulp and Paper by the Direct-Atomization Technique,
W75-10489 5A

LARKIN, P. A.
The Biological Half-Life of Inorganic Mercury in the Dungeness Crab (Cancer magister),
W75-10437 5C

LAW, P.
Water Reuse in a Paper Reprocessing Plant,
W75-10401 5D

LEAF, C. F.
Land Use Simulation Model of the Subalpine Coniferous Forest Zone,
W75-10404 3B

Simulating Timber Yields and Hydrologic Impacts Resulting From Timber Harvest on Subalpine Watersheds,
W75-10406 3B

Watershed Management in the Rocky Mountain Subalpine Zone: The Status of Our Knowledge,
W75-10405 3B

LEDERMAN, P. B.
Waste Oil Management--The Environmental Protection Agency's Role,
W75-10742 5G

LEDVINA, M. M.
Acute Toxicities of 3-Trifluoromethyl-4-Nitrophenol (TFM) and 2',5-Dichloro-4'-Nitrosalicylanilide (Bayer 73) to Larvae of the Midge (Chironomus Tentans),
W75-10698 5C

LEE, E. G-H.
Effect of Temperature and Sludge Loading on 5-Day BOD Removal and Sludge Settleability in Activated Sludge Systems Treating Bleached Kraft Effluents,
W75-10379 5D

Rotating Biological Disk Treatment of Kraft Mill Effluents,
W75-10390 5D

LEITHE, W.
Analytic Characterization of Sewer Loading by Spent Liquors of the Pulp Industry (Analytische Kennzeichung der Belastung der

LEITHE, W.

Vorfluter durch Ablaugen der Zellstoffindustrie),
W75-10381 5D

LEVY, B.
Cross Spectra of Short-Duration Rainfall,
W75-10514 2B

LEWIN, V. H.
Corrosion and Its Cost in Sewage Treatment,
W75-10364 8G

LEWIS, C. J.
Water Pollution Problems Associated with Control of Stack Gas Emission,
W75-10691 5B

LEWIS, E. A.
Economic Impact of the Conversion of Water from Irrigation to Municipal and Industrial Use in the Rio Grande Basin of New Mexico,
W75-10771 6D

LI, C.
Physical Model Study of Circulation Patterns in Lake Ontario,
W75-10537 2H

LIEBENOW, W. F.
Re-Refined Diesel Locomotive Lubricating Oil,
W75-10761 5D

LIEBERMAN, M.
Disposal and/or Recycle of Air Force Waste Petroleum Oils and Lubricants,
W75-10749 5D

LINDALL, W. N. JR.
Additional Studies of the Fishes, Macroinvertebrates and Hydrological Conditions of Upland Canals in Tampa Bay, Florida,
W75-10617 5C

LINDSTROM, F. T.
A Theory of the Mass Transport of Previously Distributed Chemicals in a Water-Saturated Sorbing Porous Medium: 4. Distributions,
W75-10632 5B

LINSTEDT, K. D.
Vacuum Filtration Cost Optimization,
W75-10681 5D

LIVELY, L. D.
Analysis of Wastewater Treatment Systems for a Meat Processing Plant,
W75-10687 5D

LONG, J. R.
NBS Adds Foreign Wrinkle to Standards Work,
W75-10490 5A

LONG, M. T.
Waste Oil in Maryland: A Pollutant or a Resource,
W75-10744 5B

LONGUET-HIGGINS, M. S.
On the Joint Distribution of the Periods and Amplitudes of Sea Waves,
W75-10534 2L

LOVELL, R. T.
Essentiality of Vitamin C in Feeds for Intensively Fed Caged Channel Catfish,
W75-10362 8I

LOWHAM, H. W.
Temperatures of Wyoming Streams,
W75-10604 7C

LUTTINGER, L. B.
Gravity Dewatering of Metal Hydroxide Sludges,
W75-10500 5D

LUXMOORE, R. J.
Flooding and Soil Temperature Effects on Wheat During Grain Filling,
W75-10829 3F

LYONS, T. C.
Evaluation of Agricultural Drainage in Water Quality Management,
W75-10796 5G

MACKAY, J. R.
Snow Creep: Its Engineering Problems and Some Techniques and Results of Its Investigation,
W75-10503 2C

MAKI, A. W.
Toxicity of the Lampricide 3-Trifluoromethyl-4-nitrophenol (TFM) to 10 Species of Algae,
W75-10697 5C

MAKKI, YAHIA
Some Effects of Field Weathering of Seed Cotton in a Desert Environment,
W75-10557 3F

MALTEZOU, S.
Waste Oil: The Recapture of an Energy Resource (The Generation, Disposal and Recovery of Waste Oil in the New York Metropolitan Area),
W75-10745 5D

MANN, H.
Effect of a Mixture of Succinic Acid Mono-Sulpho-Ester and Olefin Sulfonate on Fish (Uber die Wirkung einer Mischung von Sulfobernsteinsaure-halbester und Olefinsulfonat auf Fische),
W75-10409 5C

MANN, R.
Rivers in the City,
W75-10723 6B

MAR, B. W.
Disposal of Digested Sewage Sludge by Landfill,
W75-10682 5D

MARANI, A.
Effects of Soil Moisture on Stress on 2 Varieties of Upland Cotton in Israel: IV. Effects of Periods of Stress Occurrence, Correlations and Regressions,
W75-10791 3F

MARKANDYA, A.
Pollution Control and Optimal Taxation: A Static Analysis,
W75-10359 6E

MARKING, L. L.
Effects of pH on Toxicity of Antimycin to Fish,
W75-10450 5C

Toxicity of Paired Mixtures of Candidate Forest Insecticides to Rainbow Trout,
W75-10439 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) To Nontarget Fish in Flow- Through Tests,
W75-10702 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) to Selected Aquatic Invertebrates and Frog Larvae,
W75-10703 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) to the Nontarget Fish in Static Tests,
W75-10701 5C

MARSHALL, M.
The Lower Colorado River: A Bibliography,
W75-10453 10C

MARTIN, E. J.
An Economic Model of Waste Oil Recovery, Reprocessing and Distribution Systems,
W75-10768 5D

MARTIN, W. R. B.
The Mutual Destruction of Polluting Factors in Waste Liquors,
W75-10645 5D

MARTIN, W. W.
Fluid-Dynamic Excitation Involving Flow Instability,
W75-10544 8B

MARTINELLI, M. JR.
Snow Avalanche Sites: Their Identification and Evaluation,
W75-10659 2C

Water-Yield Improvement from Alpine Areas: The Status of Our Knowledge,
W75-10660 3B

MASON, D. D.
Relationships Between Drouth and Corn Yields on Selected South Atlantic Coastal Plain Soils,
W75-10721 3F

MASSOUMI, A.
Atomic-Absorption Spectrometric Determination of Copper, Lead, Cadmium and Manganese in Pulp and Paper by the Direct-Atomization Technique,
W75-10489 5A

MATHEWS, W. H.
Snow Creep: Its Engineering Problems and Some Techniques and Results of Its Investigation,
W75-10503 2C

MATSUI, M.
Determination of Manganese in Natural Waters by Atomic Absortion Spectrometry with a Carbon Tube Atomizer,
W75-10386 5A

MAUCK, W. L.
Toxicity of Paired Mixtures of Candidate Forest Insecticides to Rainbow Trout,
W75-10439 5C

MAYER, F. L. JR.
Toxaphene Effects on Growth and Development of Brook Trout (Salvelinus Fontinalis),
W75-10621 5C

MAYO, L. R.
Icings Along the Trans-Alaska Pipeline Route,
W75-10592 2C

MCANENY, C. C.
Project Lost Creek: Field Tests of Mounding and Controlled Blasting,
W75-10553 8H

MCBRIDE, J.
Acute Toxicity of Kanamycin to Steelhead Trout (Salmo Gairdneri),
W75-10423 5C

MCCOY, B.
Waste Automotive Lubricating Oil as a Municipal Incinerator Fuel,
W75-10764 5D

MCCOY, E.
Production of Microbial Protein From Waste Cellulose by Thermomonospora Fusca, A Thermophilic Actinomycete,
W75-10538 5C

MCCRACKEN, R. J.
Relationships Between Drouth and Corn Yields on Selected South Atlantic Coastal Plain Soils,
W75-10721 3F

MCGILL, H. N.
Effects of Surface Drainage on Stream Flow,
W75-10794 4A

MCKEE, M.
Algorithmic Modeling and the Straw Man,
W75-10820 6A

MCKELLAR, C. D.
Navigation Conditions at Cannelton Locks and Dam, Ohio River; Hydraulic Model Investigation,
W75-10667 8B

MCLEAY, D. J.
Effects of Acute Exposure to Bleached Kraft Pulp Mill Effluent on Carbohydrate Metabolism of Juvenile Coho Salmon (Oncorhynchus Kisutch) During Rest and Exercise,
W75-10388 5C

MCLEESE, D. W.
Toxicity of Phosphamidon to American Lobsters (Homarus Americanus) Held at 4 and 12C,
W75-10413 5C

MCMILLAN, L.
An Economic Model of Waste Oil Recovery, Reprocessing and Distribution Systems,
W75-10768 5D

MCWHIRTER, J. R.
Integral Circular Wastewater Treatment Plant,
W75-10729 5D

MEHRLE, P. M.
Toxaphene Effects on Growth and Development of Brook Trout (Salvelinus Fontinalis),
W75-10621 5C

MEIER, P. G.
Analysis of Pollution from Marine Engines - Status Report,
W75-10688 5A

MERALI, Z.
Persistence of Cadmium-Induced Metabolic Changes in Liver and Kidney,
W75-10478 5A

MERCER, L. J.
Political Participation and Water Rates. A Closer Look,
W75-10361 6C

MERRETT, R. H.
800 Miles to Go,
W75-10638 5C

MERRIAM, J. L.
Float Valve Provides Variable Flow Rates at Low Pressures,
W75-10789 8C

METCALF, R. L.
Uptake of Three Polychlorinated Biphenyls, DDT and DDE by the Green Sunfish, Lepomis Cyanellus Raf.,
W75-10422 5C

MIERSCH, K.
Investigations on the Production of Hygienic Compost from Air-Dried Sewage Using Different Additives (Versuche zur Herstellung von hygienisch einwandfreiem Kompost aus luftgetrocknetem Faulschlamm unter Verwendung verschiedener Zusaetze),
W75-10834 5D

MILLEMANN, R. E.
Effects of the Insecticide Sevin and Its First Hydrolytic Product, 1-Napthol, on Some Early Developmental Stages of the Bay Mussel, Mytilus edulis,
W75-10435 5C

MILLER, J. R. JR.
Weather Modification for Use in the High Plains,
W75-10775 3B

MILLER, L. L.
Hydrologic Reconnaissance of the Southern Uinta Basin, Utah and Colorado,
W75-10585 3B

MILLER, W. L.
Operational Value of Weather Information in Relation to Soil Management Characteristics,
W75-10367 2G

MITCI, C.
Determine Urban Runoff the Simple Way,
W75-10716 2E

MOODY, W. B.
Effects of Surface Drainage on Stream Flow,
W75-10794 4A

MORAN, J. B.
Health Implications of Exposure to Trace Metals from Combustion of Waste Oil,
W75-10765 5C

MOREAU, J.
Serpaflo: Original Solution to Cleaning Paper Mill Effluents (Serpaflo; La solution originale d'epuration des eaux papeteries),
W75-10389 5D

MORGAN, W. D.
Political Participation and Water Rates. A Closer Look,
W75-10361 6C

MORI, M.
Treatment of Service Water with Ozone,
W75-10840 5D

MORRIS, W. D.
Wave Climate Model of the Mid-Atlantic Shelf and Shoreline (Virginian Sea), Model Development, Shelf Geomorphology, and Preliminary Results,
W75-10552 2L

MOSEY, F. E.
The Toxicity of Heavy Metal Ions to Anaerobic Digestion,
W75-10843 5D

MUELLER, J. C.
Effect of Temperature and Sludge Loading on 5-Day BOD Removal and Sludge Settleability in Activated Sludge Systems Treating Bleached Kraft Effluents,
W75-10379 5D

Rotating Biological Disk Treatment of Kraft Mill Effluents,
W75-10390 5D

MUELLER, W.
Investigations on the Production of Hygienic Compost from Air-Dried Sewage Using Different Additives (Versuche zur Herstellung von hygienisch einwandfreiem Kompost aus luftgetrocknetem Faulschlamm unter Verwendung verschiedener Zusaetze),
W75-10834 5D

MULLA, M. S.
Biological Activity of Organophosphorus Compounds and Synthetic Pyrethroids Against Immature Mosquitoes,
W75-10631 5G

MUNNECKE, T.
Methodological Application of the Straw Man Decision Structure to a Hypothetical Case: The Dorfman-Jacoby Water Quality Model,
W75-10811 6A

Qualitative Sign Matrix Manipulation,
W75-10815 6A

MURAKAMI, M.
Electron Microscope Autoradiography of Kidney After Administration of PB-210 in Mice,
W75-10476 5A

MURPHY, L. L.
An Effluent Study of a Fresh Water Fish Processing Plant,
W75-10684 5D

MURRAY, D. A. J.
Analysis of Tri-Aryl Phosphate Esters and the Determination of Imol S-140 in Fish Tissue and Water Samples by Gas Chromatography,
W75-10442 5A

MURTY, T. S.
Some Features of Tsunamis on the Pacific Coast of South and North America,
W75-10554 2L

NAGARKAR, S. G.
Rapid Extractive Spectrophotometric Determination of Gold (III) With 4-(2-Pyridylazo)-Resorcinol,
W75-10499 2K

NAGEL, T.
Report to the Technical Committee of the Water Resources Centers of the Thirteen Western States,
W75-10809 6B

NARASIMHAN, T. N.
Seepage from Recharge and Landfill Ditches,
W75-10770 5B

NARVER, D. W.
Aspects of the Winter Ecology of Juvenile Coho Salmon (Oncorhynchus Kisutch) and Steelhead Trout (Salmo Gairdneri),
W75-10615 5C

NASSAR, E. G.
Flood Hazards in the Seattle-Tacoma Urban Complex and Adjacent Areas, Washington,
W75-10580 7C

NATUSCH, D. F. S.
Toxic Trace Elements: Preferential Concentration in Respirable Particles,
W75-10482 5A

NAUDASCHER, E.
Fluid-Dynamic Excitation Involving Flow Instability,
W75-10544 8B

NEMEROW, N. L.
Lagoons Plus Spray Irrigation for Effective Bean Cannery Waste Treatment,
W75-10678 5D

NEWBOLD, C.
Herbicides in Aquatic Systems,
W75-10625 5C

NEWSOME, C.
Effect of Water Hardness on the Toxicity of a Nonionic Detergent to Fish,
W75-10444 5C

NEWSOME, C. S.
Absorption, Metabolism, and Excretion by Goldfish of the Anionic Detergent Sodium Lauryl Sulphate,
W75-10626 5C

NICKLESS, G.
Absorption of Cadmium, Copper and Zinc by Dog Whelks in the Bristol Channel,
W75-10481 5B

NICKS, A. D.
Stochastic Generation of the Occurrence, Pattern, and Location of Maximum Amount of Daily Rainfall,
W75-10516 2B

NIKITIN, YA. V.
Instruction for Record Keeping of Water Consumption at the Enterprises of the Paper Industry (Instruktsiya ucheta raskhoda vody na predpriyatiyakh otrasli),
W75-10370 3E

NUTTER, L. J.
Hydrogeology of the Triassic Rocks of Maryland,
W75-10584 2F

O'BRIEN, B.
Amendments to the Water Act,
W75-10835 5G

O'BRIEN, W. J.
Waste Water Treatment: Lagoons and Oxidation Ponds,
W75-10374 5D

O'CONNOR, J. T.
Deterioration of Water Quality in Distribution Systems,
W75-10711 5F

O'LOUGHLIN, E. M.
Predicting the Concentration of Aquatic Herbicide Residues in Waterways,
W75-10648 5B

O'NEIL, R. A.
A Remote Sensing Laser Fluorometer,
W75-10831 5A

OKERA, W.
Tar Pollution of Sierra Leone Beaches,
W75-10472 5B

OLSON, B. R. JR.
Development of Large Scale Drip Irrigation Systems,
W75-10784 3F

OLSON, L. E.
Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) to the Nontarget Fish in Static Tests,
W75-10701 5C

OMAYE, S. T.
Effect of Dietary Selenium on Glutathione Peroxidase in the Chick,
W75-10495 5A

ONSTAD, C. A.
ACTMO, An Agricultural Chemical Transport Model,
W75-10846 5B

OSBORN, H. B.
Stochastic Models of Spatial and Temporal Distribution of Thunderstorm Rainfall,
W75-10519 2B

OSWOOD, M. W.
An Investigation of the Ecology and Water Quality of a Lake Outlet,
W75-10724 5C

OULMAN, C. S.
Five Year Study of Des Moines River Water Quality,
W75-10803 5B

OUTLAW, D. G.
Lake Erie International Jetport Model Feasibility Investigation, Physical Model Feasibility Study,
W75-10670 8B

OVERFIELD, J. L.
Oil Contaminated Water Recycling System,
W75-10760 5D

OVERNELL, J.
The Effect of Heavy Metals on Photosynthesis and Loss of Cell Potassium in Two Species of Marine Algae, Dunaliella tertiolecta and Phaeodactylum tricornutum,
W75-10447 5C

The Effect of Some Heavy Metal Ions on Photosynthesis in a Freshwater Alga,
W75-10627 5C

PADMANABHAN, M.
Fluid-Dynamic Excitation Involving Flow Instability,
W75-10544 8B

PAGE, J. W.
Growth Factors in the Fish Meal Components of Catfish Diets,
W75-10658 2I

PALMER, W. T.
The Influence Surface Method for Floating Ice Plates,
W75-10504 2C

PARKER, B. C.
Enrichment of Surface Freshwater Microlayers with Algae,
W75-10583 5A

PATTERSON, T. C.
Water Use and Production of Trickle Irrigated Onions,
W75-10785 3F

PAULSON, W. L.
Analysis of Wastewater Treatment Systems for a Meat Processing Plant,
W75-10687 5D

PEARSON, G. M.
Removal of Pollutants from Water,
W75-10736 5D

PETTIS, R. W.
Trace Elements in Melbourne Rivers - An Interlaboratory Analysis,
W75-10649 5A

PETZOLD, S.
Principles of Establishing Sewer Systems in the Rural Settlements of Magdeburg County (Grundlagen fuer die Abwasser-Technische Erschliessung von Landgemeinden im Bezirk Magdeburg),
W75-10833 5D

PEWE, T. L.
Geomorphic Processes in Polar Deserts,
W75-10456 2C

PHILLIP, A. T.
Trace Elements in Melbourne Rivers - An Interlaboratory Analysis,
W75-10649 5A

PHILP, D. H.
Color Removal From Bleached Kraft Effluents,
W75-10399 5D

PICKERING, G. A.
Flood Control Project on Lytle and Warm Creeks and Santa Ana River, California; Hydraulic Model Investigation,
W75-10668 8B

PILLSBURY, A. F.
Problems of Water Quality Management in Western River Basin Systems,
W75-10804 5G

PILSON, M. E. Q.
Arsenate Uptake and Reduction by Pocillopora verrucosa,
W75-10491 5C

PIPES, A.
Nonlinear Channel Routing by Computer,
W75-10543 4A

PIVOVAROV, V. G.
Increasing the Efficiency of Flotation Savealls (Povyshenie effektivnosti raboty flotatsionnykh lovushek),
W75-10369 5D

POLLACK, B. L.
Waste Oil--Solution to Maryland's Energy Crisis,
W75-10762 5D

POWELL, G. M.
Groundwater Model as a Tool in Planning and Management,
W75-10781 4B

PRICE, R. I.
USCG Sets Broader Use of Pollution Control Systems,
W75-10466 5G

PRINCE, D.
Hydrologic Reconnaissance of the Southern Uinta Basin, Utah and Colorado,
W75-10585 3B

PUGH, C. A.
Turbulent Flow in Rectangular Outlet Conduit, Rend Lake Dam, Big Muddy River, Illinois,
W75-10666 8B

PULICH, W. M. JR.
The Effects of a No. 2 Fuel Oil and Two Crude Oils on the Growth and Photosynthesis of Microalgae,
W75-10436 5C

QUICK, M. C.
Nonlinear Channel Routing by Computer,
W75-10543 4A

RABINOWITZ, M. B.
Lead Metabolism in the Normal Human: Stable Isotope Studies,
W75-10484 5A

RAGLAND, D. V.
Evaluation of Three Side Channels and the Main Channel Border of the Middle Mississippi River as Fish Habitat,
W75-10451 5C

RAINS, D. W.
Characterization of Cadmium Uptake by Plant Tissue,
W75-10479 5B

RANDALL, K. J.
Port Reception and Treatment Facilities for Oily Waste from Vessels,
W75-10751 5G

RANDOLPH, V. G.
Pipeline Stress Analysis,
W75-10824 8B

RANEY, D. C.
A Numerical Model for Predicting the Effects of Landslide-Generated Water Waves,
W75-10661 8A

RAWLINS, S. L.
Irrigation Management for Salt Control,
W75-10800 3C

REED, J. C.
Review of Development of Arctic Resources,
W75-10462 2C

REESE, R. L.
Responses of 'Bearss' Lemon to Nitrogen, Potassium and Irrigation Applications,
W75-10714 3F

REID, G.
Water Reuse in a Paper Reprocessing Plant,
W75-10401 5D

REIN, D. A.
Vacuum Filtration Cost Optimization,
W75-10681 5D

REVELANTE, N.
The Concentration of Mercury, Copper, Nickel, Silver, Cadmium and Lead in the Northern Adriatic Anchovy, Engraulis Encrasicholus, and Sardine, Sardina Pilchardus,
W75-10620 5B

RHOADES, E. D.
Sediment-Yield Characteristics from Unit Source Watersheds,
W75-10848 2J

RHOADES, J. D.
Irrigation Management for Salt Control,
W75-10800 3C

RICE, S. D.
Acute Toxicity of Ammonia to Several Developmental, Stages of Rainbow Trout, Salmo Gairdneri,
W75-10619 5C

RICE, W.
Wisconsin Tissue Mills One Year After Startup of the Effluent Plant,
W75-10378 5D

RICHARD, J. W.
Oil Contaminated Water Recycling System,
W75-10760 5D

RIDDLE, M. J.
An Effluent Study of a Fresh Water Fish Processing Plant,
W75-10684 5D

RITCHIE, D. E. JR.
Daily Temperature and Salinity of Surface Water of Patuxent River at Solomons, Maryland, Based on 30 Years of Records (1938-1967),
W75-10535 2E

RITTER, D. F.
Competence of Rivers to Transport Coarse Bedload Material,
W75-10540 2J

ROBECK, G. G.
Treatment Processes for Coping with Variation in Raw-Water Quality,
W75-10705 5F

ROBERTSON, J. A. JR
Groundwater Control by Pumping,
W75-10778 4B

RODIS, H. G.
The Loxahatchee - A River in Distress, Southeast Florida,
W75-10588 4C

ROESLER, J. F.
Plant Performance Using Dissolved Oxygen Control,
W75-10452 5D

ROGGENSACK, W. D.
Large Scale Laboratory Direct Shear Tests on Ice,
W75-10502 2C

ROSENBAUM, D. H.
Review of the Economic Benefits and Costs Resulting from Dewey Reservoir,
W75-10828 6B

ROSENBERG, R.
Toxic Effects of Aliphatic Chlorinated by-Products from Vinyl Chloride Production on Marine Animals,
W75-10412 5C

ROSENTHAL, H.
Combined Effects of Cadmium and Salinity on Development and Survival of Herring Eggs,
W75-10704 5C

ROSS, W. L.
Integral Circuiar Wastewater Treatment Plant,
W75-10729 5D

ROWLEY, G. W.
Indigenous Peoples of Polar Deserts,
W75-10460 6D

RUDAKOVA, A. M.
Reduction of Effluent Pollution at the Arkhangel'sk Mills (Snizhenie zagryaznennosti stochnykh vod na Arkhangel'-skom Kombinate),
W75-10368 5D

RUDDY, G. M.
The Effect of Prolonged Exposure to Elevated Temperatures on the Biochemical Constituents, Gonadal Development and Shell Deposition of the American Oyster, Crassostrea Virginica,
W75-10849 5C

RUMER, R. R.
Physical Model Study of Circulation Patterns in Lake Ontario,
W75-10537 2H

RUPPERSBERGER, J.
Water Reuse in a Paper Reprocessing Plant,
W75-10401 5D

RUSSELL, D. P.
Evaluation of Agricultural Drainage in Water Quality Management,
W75-10796 5G

RUSSELL, L. V.
Heavy Metals Removal from Wood Preserving Wastewater,
W75-10675 5D

RUTHVEN, J. A.
Response of Freshwater Protozoan Artificial Communities to Metals,
W75-10440 5C

SAGER, R. A.
Norton Point Dike Study, Coney Island, New York; Hydraulic Model Investigation,
W75-10662 8B

SAHAGIAN, J.
Waste Automotive Lubricating Oil as a Municipal Incinerator Fuel,
W75-10764 5D

SAKAGUCHI, H.
Physiological Changes in the Serum and Hepatopancreas of Yellow Tail Injected with Carbon Tetrachloride, (In Japanese),
W75-10630 5C

SALL, D. W.
Groundwater Control by Pumping,
W75-10778 4B

SAMESHIMA, K.
Color of Pulp Industry Waste Liquors. (6). Behavior of Color During Waste Treatments (In Japanese),
W75-10393 5D

Color of Pulp Industry Waste Liquors. (7). Color Reduction by Ultraviolet Treatment (In Japanese),
W75-10394 5D

SAMUELSON, O.
Spent Liquor From Peroxide Bleaching of Groundwood Pulp From Spruce,
W75-10392 5A

SANBORN, J. R.
Uptake of Three Polychlorinated Biphenyls, DDT and DDE by the Green Sunfish, Lepomis Cyanellus Raf.,
W75-10422 5C

SANCHEZ, P. A.
Phosphorus Availability of Some Philippine Rice Soils as Affected by Soil and Water Management Practices,
W75-10421 3F

SANDERS, H. O.
Toxicity and Residue Dynamics of the Lampricide 3-Trifluoro-Methyl-4-Nitrophenol (TFM) in Aquatic Invertebrates,
W75-10700 5C

SANDERS, J. L.
An Event-Based Stochastic Model of Areal Rainfall and Runoff,
W75-10521 2B

SANDSTROM, G. E.
Stockholm Puts Sewage Plants Underground,
W75-10718 5D

SAUNDERS, P. E.
Waimano Stream Flood Control Project, Pearl City, Hawaii; Hydraulic Model Investigation,
W75-10663 8B

SAVAGE, K. E.
Adsorption and Degradation of Chlorbromuron in Soil,
W75-10414 5B

SAVARESE, R. E.
Analysis of a Large Water Distribution System Using Advanced Computer Software,
W75-10720 4A

SCHAFF, J. C.
Icebreaking Drillship for Offshore Exploratory Drilling in the Arctic,
W75-10639 5G

SCHENK, J. E.
Analysis of Pollution from Marine Engines - Status Report,
W75-10688 5A

SCHIEPPATI, R.
Experience with the IFP Propane Clarification Process in Re-Refining Spent Crankcase Oils,
W75-10759 5D

SCHLEUSENER, R. A.
Weather Modification for Use in the High Plains,
W75-10775 3B

SCHMIDT, R. A.
Analog Temperature Records from a Linearized Thermistor Network,
W75-10650 7B

SCHNITZER, E.
Rotary Desalination Engine and System,
W75-10733 3A

SCHOLL, W.
Investigations on the Production of Hygienic Compost from Air-Dried Sewage Using Different Additives (Versuche zur Herstellung von hygienisch einwandfreiem Kompost aus luftgetrocknetem Faulschlamm unter Verwendung verschiedener Zusaetze),
W75-10834 5D

SCHROEDER, E. D.
Activated Sludge,
W75-10371 5D

SCHWOYER, W. L.
Gravity Dewatering of Metal Hydroxide Sludges,
W75-10500 5D

SCOTT, J. D.
Lagoons Plus Spray Irrigation for Effective Bean Cannery Waste Treatment,
W75-10678 5D

SEKIZAWA, Y.
Residue Analyses on 2-Amino-4 Phenylthiazole, a Piscine Anesthetic, in Fishes-I a Model Radio-Tracer Experiment with Medaka,
W75-10614 5A

SELLERS, C. M. JR
The Effect of Sublethal Concentrations of Copper and Zinc on Ventilatory Activity, Blood Oxygen, and pH in Rainbow Trout (Salmo Gairdneri),
W75-10624 5C

SELTZER, R. J.
Ocean Pollutants Pose Potential Danger to Man,
W75-10464 5B

SHABALIN, A. F.
Instruction for Record Keeping of Water Consumption at the Enterprises of the Paper Industry (Instruktsiya ucheta raskhoda vody na predpriyatiyakh otrasli),
W75-10370 3E

SHAMPINE, W. J.
A River-Quality Assessment of the Upper White River, Indiana,
W75-10600 5B

SHAND, C. A.
The Determination of Mercury in Soils and Related Materials by Cold-Vapour Atomic Absorption Spectrometry,
W75-10485 5A

SHAPIRO, M. A.
Some Observations on Spawning of Brook Trout (Salvelinus Fontinalis Mitchill) in Lime Neutralized Iron Hydroxide Suspensions,
W75-10445 5C

SHARPE, J. H. PETER
An Analysis of the Mechanics of Guard Cell Motion,
W75-10488 2I

SHEFFIELD, C. W.
Effects of Farming - Urban Drainage on Fresh Water,
W75-10802 5G

SHELDON, A. L.
An Investigation of the Ecology and Water Quality of a Lake Outlet,
W75-10724 5C

SHEN, H. W.
Dispersion of Contaminated Bedload Particles,
W75-10526 5B

Research in Stochastic Models for Bedload Transport,
W75-10522 2J

SHENTON, L. R.
Comments on the Statistical Distribution of Rainfall per Period Under Various Transformations,
W75-10517 2B

SHERIDAN, R. P.
Effect of the Insecticide Zectran (Mexacarbate) on Several Algae,
W75-10425 5C

SHIGEMATSU, T.
Determination of Manganese in Natural Waters by Atomic Absortion Spectrometry with a Carbon Tube Atomizer,
W75-10386 5A

SHIMMA, H.
PCBS in the Spotted Sharks, Mustelus Manazo, From Tokyo Bay, (In Japanese),
W75-10622 5A

SHIMMA, Y.
PCBS in the Spotted Sharks, Mustelus Manazo, From Tokyo Bay, (In Japanese),
W75-10622 5A

SHIMURA, M.
Residue Analyses on 2-Amino-4 Phenylthiazole, a Piscine Anesthetic, in Fishes-I a Model Radio-Tracer Experiment with Medaka,
W75-10614 5A

SHIREMAN, J. V.
Utilization of a Kraft Effluent Channel by Fish and Aquatic Organisms,
W75-10377 5C

SHURIN, A. T.
The Effect of Different Salinities and Manganese Ion on the Survival Respiration of the Baltic Flounder (Pleuronectes Flesus Trachurus (Dunker)) of the Gulf of Riga,
W75-10411 5C

SIMMONS, C. E.
Sediment Characteristics of Streams in the Eastern Piedmont and Western Coastal Plain Regions of North Carolina,
W75-10586 2J

SIMMONS, D. G.
Analysis of a Large Water Distribution System Using Advanced Computer Software,
W75-10720 4A

SIMMS, M. A.
Effect of the Insecticide Zectran (Mexacarbate) on Several Algae,
W75-10425 5C

SINGH, K. P.
A Two-Distribution Method for Fitting Mixed Distributions in Hydrology,
W75-10531 2E

SINGHAL, R. L.
Persistence of Cadmium-Induced Metabolic Changes in Liver and Kidney,
W75-10478 5A

SINYAK, YU. YE.
Problems of Space Biology. Volume 24. The Water Supply of Spacecraft Crews,
W75-10365 5D

SIVIOUR, N. G.
Removal of Pollutants from Water,
W75-10736 5D

SJOBERG, L.-A.
Spent Liquor From Peroxide Bleaching of Groundwood Pulp From Spruce,
W75-10392 5A

SKEA, J. C.
Toxicity of Two Synthetic Pyrethrins to Brown Trout,
W75-10438 5C

SKEES, P. M.
Comments on the Statistical Distribution of Rainfall per Period Under Various Transformations,
W75-10517 2B

SKIDMORE, J. F.
Toxic Effects of an Anionic Detergent on the Gills of Rainbow Trout,
W75-10434 5C

SKINNER, D. J.
Disposal of Used Crankcase and Other Oils in Canada,
W75-10743 5D

SLOAN, C. E.
Icings Along the Trans-Alaska Pipeline Route,
W75-10592 2C

SLOAN, J. P.
The Biological Half-Life of Inorganic Mercury in the Dungeness Crab (Cancer magister),
W75-10437 5C

SLOWEY, F.
Effects of an Offshore Crude Oil Unloading Terminal on the Marine Environment,
W75-10642 5C

SMIKA, D. E.
Protein Content of Winter Wheat Grain as Related to Soil and Climatic Factors in the Semi-Arid Central Great Plains,
W75-10792 3F

SMITH, E. J.
Some Observations on Spawning of Brook Trout (Salvelinus Fontinalis Mitchill) in Lime Neutralized Iron Hydroxide Suspensions,
W75-10445 5C

SMITH, J. E. JR.
Problems Encountered in Sludge Treatment and Some Advanced Solutions,
W75-10398 5E

SMITH, O. D.
Analysis of Alternatives for Removal of Suspended Solids in Pulp and Paper Mill Effluents,
W75-10400 5D

SOLONITSYN, R. A.
Increasing the Efficiency of Flotation Savealls (Povyshenie effektivnosti raboty flotatsionnykh lovushek),
W75-10369 5D

SOMMERFELD, R. A.
An Automatic Data Acquisition and Reduction System,
W75-10652 7A

A Weibull Prediction of the Tensile Strength-Volume Relationship of Snow,
W75-10651 2C

SOPHER, C. D.
Relationships Between Drouth and Corn Yields on Selected South Atlantic Coastal Plain Soils,
W75-10721 3F

SORIO, A.
Determination of Cadmium, Copper, and Lead in Natural Waters After Anion-Exchange Separation,
W75-10385 5A

SPARLING, J. H.
Measurement of Hydraulic Conductivity of Peats,
W75-10536 7B

SPERLING, K. R.
Combined Effects of Cadmium and Salinity on Development and Survival of Herring Eggs,
W75-10704 5C

SPRAGUE, J. B.
Temperature-Induced Changes in Acute Toxicity of Zinc to Atlantic Salmon (Salmo salar),
W75-10431 5C

STACHE, H.
Effect of a Mixture of Succinic Acid Mono-Sulpho-Ester and Olefin Sulfonate on Fish (Uber die Wirkung einer Mischung von Sulfobernsteinsaure-halbester und Olefinsulfonat auf Fische),
W75-10409 5C

STANEK, J.
Use of Organic Flocculants for Textile Plant Water Treatment (Pouziti organickych flokulantu k cireni vody pro technologii textilni vyroby),
W75-10383 5F

STAPLETON, H. N.
Some Effects of Field Weathering of Seed Cotton in a Desert Environment,
W75-10557 3F

STEIN, R. M.
Analysis of Alternatives for Removal of Suspended Solids in Pulp and Paper Mill Effluents,
W75-10400 5D

STEINNES, E.
Determination of Nickel in Rocks After Epithermal Neutron Activation,
W75-10493 2K

STENNER, R. D.
Absorption of Cadmium, Copper and Zinc by Dog Whelks in the Bristol Channel,
W75-10481 5B

STEWART, K. W.
The Drift of Mayflies (Ephemeroptera) in the Brazos River, Texas,
W75-10558 5B

STOKES, R. M.
Acute Toxicity of Ammonia to Several Developmental, Stages of Rainbow Trout, Salmo Gairdneri,
W75-10619 5C

STOLZY, L. H.
Flooding and Soil Temperature Effects on Wheat During Grain Filling,
W75-10829 3F

STONER, J. H.
Average Trace Element Composition of Low Level Marine Atmospheric Particulates,
W75-10477 5B

STOUT, D. W.
Closed Recycling System for Water Purification and Waste Reduction,
W75-10735 5D

STRASDINE, G.
Acute Toxicity of Kanamycin to Steelhead Trout (Salmo Gairdneri),
W75-10423 5C

STRAUCH, D.
Investigations on the Production of Hygienic Compost from Air-Dried Sewage Using Different Additives (Versuche zur Herstellung von hygienisch einwandfreiem Kompost aus luftgetrockneten Faulschlamm unter Verwendung verschiedener Zusaetze),
W75-10834 5D

STREEBIN, L.
Water Reuse in a Paper Reprocessing Plant,
W75-10401 5D

STREET, D. R.
The Economic Impact of Mercury Pollution on Fisheries and Other Related Businesses Around Pickwick Lake,
W75-10356 5G

Industrial Interdependencies and External Diseconomies of Water Resources,
W75-10358 6B

Principles and standards for Water Planning,
W75-10355 6B

STRIGNER, P. L.
Disposal of Used Crankcase and Other Oils in Canada,
W75-10743 5D

STUBERGH, J. R.
Atomic Absorption Spectrometric Determination of Cadmium, Lead, Silver, Thallium and Zinc in Silicate Rocks by Direct Atomization From the Solid State,
W75-10492 2K

SUMIMOTO, M.
Color of Pulp Industry Waste Liquors. (6). Behavior of Color During Waste Treatments (In Japanese),
W75-10393 5D

Color of Pulp Industry Waste Liquors. (7). Color Reduction by Ultraviolet Treatment (In Japanese),
W75-10394 5D

SUN, L. T.
Effects of Heavy Metals and Pesticides on the Mass Mortalities of Cultured Shellfishes Along the Southwest Coast of Taiwan, (In Chinese),
W75-10427 5C

SURPRENANT, N.
Waste Automotive Lubricating Oil as a Municipal Incinerator Fuel,
W75-10764 5D

SUTHERLAND, D. J. B.
Persistence of Cadmium-Induced Metabolic Changes in Liver and Kidney,
W75-10478 5A

SUZUKI, A.
Residue Analyses on 2-Amino-4 Phenylthiazole, a Piscine Anesthetic, in Fishes-I a Model Radio-Tracer Experiment with Medaka,
W75-10614 5A

SUZUKI, T.
Experimental Investigation on the Biological Concentration of Mercury-I. On the Rate of Mercury Transfer Through the Food Chain From Jack Mackerel to Young Yellowtail (In Japanese),
W75-10441 5C

SYKORA, J. L.
Some Observations on Spawning of Brook Trout (Salvelinus Fontinalis Mitchill) in Lime Neutralized Iron Hydroxide Suspensions,
W75-10445 5C

SYLVESTER, J. R.
Critical Thermal Maxima of Three Species of Hawaiian Estuarine Fish: A Comparative Study,
W75-10426 5C

SYMONS, J. M.
Treatment Processes for Coping with Variation in Raw-Water Quality,
W75-10705 5F

SYNAK, M.
Some Observations on Spawning of Brook Trout (Salvelinus Fontinalis Mitchill) in Lime Neutralized Iron Hydroxide Suspensions,
W75-10445 5C

SYNDER, C. D.
Disposal of Liquid Effluent by Land Irrigation at Lagro Celotex Plant,
W75-10679 5D

TABATA, N.
Treatment of Service Water with Ozone,
W75-10840 5D

TABLER, R. D.
Estimating the Transport and Evaporation of Blowing Snow,
W75-10695 2C

New Engineering Criteria for Snow Fence Systems,
W75-10692 2C

New Snow Fence Design Controls Drifts, Improves Visibility, Reduces Road Ice,
W75-10693 2C

TABOR, C. C.
Wellton-Mohawk Drainage and the Mexican Salt Problem,
W75-10783 4A

TAGATZ, M. E.
A Gravity-Flow Column to Provide Pesticide-Laden Water for Aquatic Bioassays,
W75-10844 5A

TAKEUCHI, K.
Necessary Adaptations for Significant Utilization of the Information System,
W75-10816 6A

TAKEUCHI, T.
Spectroscopic Determination of Atomization Efficiency (CuCl-Cu+Cl) in an Air-Hydrogen Flame,
W75-10498 2K

TALBOT, C.
Toxicity of Two Synthetic Pyrethrins to Brown Trout,
W75-10438 5C

TANASIJEVIC, D. M.
Pedologic Cover of the Watershed of the Porecka River,
W75-10551 2A

TAPPEL, A. L.
Effect of Dietary Selenium on Glutathione Peroxidase in the Chick,
W75-10495 5A

TASKER, G. D.
A Comparison of Methods for Estimating Flood Peaks on Streams in Massachusetts,
W75-10587 4A

TATSUMOTO, M.
Uranium, Thorium, and Lead Concentrations in Three Silicate Standards and a Method of Lead Isotopic Analysis,
W75-10494 2K

TEDROW, J. C. F.
Soils of the High Arctic Landscapes,
W75-10458 2C

TEER, E. H.
Heavy Metals Removal from Wood Preserving Wastewater,
W75-10675 5D

TEHAN, J. E.
Treatment of Winery Wastes by Aerated Lagoon, Activated Sludge, and Rotating Biological Contractor,
W75-10685 5D

TEL, D. A.
Phosphorus in Percolates from Manured Lysimeters,
W75-10573 5B

THAKER, I. H.
Treatment of Winery Wastes by Aerated Lagoon, Activated Sludge, and Rotating Biological Contractor,
W75-10685 5D

THARPE, E. J.
Low-Flow Characteristics of Mississippi Streams,
W75-10605 2E

Water for Industrial Development in Alcorn, Itawamba, Prentiss, and Tishomingo Counties, Mississippi,
W75-10581 3E

THOMAS, R. B.
A Model of Statistical Errors in Estimating Streamflow from Continuous-Stage Records,
W75-10512 2E

THOMAS, R. W. L.
Error Analysis of Dobson Spectrophotometer Measurements of the Total Atmospheric Ozone Content,
W75-10545 7B

THOMASSEN, Y.
Atomic Absorption Spectrometric Determination of Cadmium, Lead, Silver, Thallium and Zinc in Silicate Rocks by Direct Atomization From the Solid State,
W75-10492 2K

Atomic-Absorption Spectrometric Determination of Copper, Lead, Cadmium and Manganese in Pulp and Paper by the Direct-Atomization Technique,
W75-10489 5A

THOMPSON, J. A. J.
The Biological Half-Life of Inorganic Mercury in the Dungeness Crab (Cancer magister),
W75-10437 5C

TIETENBERG, T. H.
Derived Decision Rules for Pollution Control in a General Equilibrium Space Economy,
W75-10360 6C

TODOROVIC, P.
Stochastic Model of Daily Rainfall,
W75-10520 2B

A Stochastic Model of Sediment Yield for Ephemeral Streams,
W75-10524 2J

TOFFLEMIRE, T. J.
Waste Water Treatment: Land Disposal of Waste Water,
W75-10373 5E

TOREN, R. L.
Art of Agricultural Drainage Design and Costs,
W75-10797 4A

TOVELL, P. W. A.
Absorption, Metabolism, and Excretion by Goldfish of the Anionic Detergent Sodium Lauryl Sulphate,
W75-10626 5C

Effect of Water Hardness on the Toxicity of a Nonionic Detergent to Fish,
W75-10444 5C

TUSSEY, R. C. JR.
Analysis of Reservoir Recreation Benefits,
W75-10826 6B

TUSSING, A. R.
Processes and Costs Imposed by Environmental Stress,
W75-10461 2C

TWOMEY, D. W.
The Source and Supply of Virgin Lubes,
W75-10741 5B

UHRMACHER, J. C.
Waste Oil--Solution to Maryland's Energy Crisis,
W75-10762 5D

UMEMURA, K.
Residue Analyses on 2-Amino-4 Phenylthiazole, a Piscine Anesthetic, in Fishes-I a Model Radio-Tracer Experiment with Medaka,
W75-10614 5A

URE, A. M.
The Determination of Mercury in Soils and Related Materials by Cold-Vapour Atomic Absorption Spectrometry,
W75-10485 5A

UZUNER, M. S.
Hydraulics and Mechanics of River Ice Jams,
W75-10556 8B

VALENTINE, B. W.
Water and Wastewater Facilities for Florida Housing Developments,
W75-10717 5D

VAN BAALEN, C.
The Effects of a No. 2 Fuel Oil and Two Crude Oils on the Growth and Photosynthesis of Microalgae,
W75-10436 5C

VAN HUISEN, A. T.
Geothermal Channel and Harbor Ice Control System,
W75-10734 4A

VAN SCHILFGAARDE, J.
Irrigation Management for Salt Control,
W75-10800 3C

VAN SOEST, R.
Wisconsin Tissue Mills One Year After Startup of the Effluent Plant,
W75-10378 5D

VAN VOORHIS, P. W.
Characteristics of Oil Pollution in and Around U.S. Waters,
W75-10754 5B

VARMA, M. M.
Population Dynamics of Protozoa in Wastewater, and Impact of Environmental Changes,
W75-10689 5D

VITTETOE, G. C.
Effects of Surface Drainage on Stream Flow,
W75-10794 4A

VIVIANI, R.
Residues of Polychlorinated Biphenyls (PCB) and Chlorinated Pesticides in Fish and Birds of the Po Delta, (Residus de Polychlorobiphenyls (PCB) et de Pesticides Chlores Dans Les Poissons et Les Oiseaux du Delta du Po),
W75-10446 5B

VU QUANG, D.
Experience with the IFP Propane Clarification Process in Re-Refining Spent Crankcase Oils,
W75-10759 5D

WADE, J. C.
Developing Regional Stochastic Data Bases,
W75-10528 2E

WAGGONER, J. P.
DDT : Short Term Effects on Osmoregulation in Black Surfperch (Embiotoca Jacksoni),
W75-10429 5C

WAGNER, R. N.
Laboratory Measurement of Surface Temperature Fluctuations Induced by Small Amplitude Surface Waves,
W75-10505 2L

WALCOTT, F. R.
Water Collection and Storage Dispersion Apparatus,
W75-10727 4A

WALDEN, C. C.
Effect of Temperature and Sludge Loading on 5-Day BOD Removal and Sludge Settleability in Activated Sludge Systems Treating Bleached Kraft Effluents,
W75-10379 5D

WALLACE, J. R.
Statistical Tolerance Limits for a Pearson Type III Distribution,
W75-10511 2E

Toxic Trace Elements: Preferential Concentration in Respirable Particles,
W75-10482 5A

WALLER, R.
Oily Bilge from Commercial Vessels,
W75-10752 5B

WALSH, D. F.
Toxicity and Residue Dynamics of the Lampricide 3-Trifluoro-Methyl-4-Nitrophenol (TFM) in Aquatic Invertebrates,
W75-10700 5C

WALTHER, H.-J.
Studies on Possibilities of Biochemical Purification of Evaporator Condensate Occurring During Sulfite Pulp Manufacture (Untersuchungen ueber die Moeglichkeit der biochemischen Reinigung des bei der Sulfitzellstoffherstellung anfallenden Eindampfkondensates),
W75-10382 5D

WANG, G. S.
Effects of Heavy Metals and Pesticides on the Mass Mortalities of Cultured Shellfishes Along the Southwest Coast of Taiwan, (In Chinese),
W75-10427 5C

Heavy Metal Contents of Fishes Caught in Kaohsiung Harbor, (In Chinese),
W75-10430 5A

WARD, C. H.
Biological Bases for Water Quality Standards,
W75-10677 5G

WARD, D. M.
Environmental Limitations on the Microbial Degradation of Hydrocarbons in Temperate Lakes,
W75-10407 5C

WARD, G. M.
The Perimeter Canal - A New Approach to Discharge Urban Water into a Coastal Mangrove Area,
W75-10773 4A

WARREN, G. F.
Water-Soil-Plant Interactions with Terbacil,
W75-10486 5C

WASSON, B. E.
Water for Industrial Development in Alcorn, Itawamba, Prentiss, and Tishomingo Counties, Mississippi,
W75-10581 3E

WATANABE, T.
The Effect of the Quantity of Silt to the Attached Microorganisms of the Kuzuryu-Gawa River in the Hokuriku District, (In Japanese),
W75010696 5C

WATTS, E. G.
Copper, Zinc and Total Protein Levels in the Plasma of Sockeye Salmon (Oncorhynchus Nerka) During Their Spawning Migration,
W75-10613 5C

WEBBER, L. R.
Phosphorus in Percolates from Manured Lysimeters,
W75-10573 5B

WEBER, J. H.
Organic Matter in Natural Water and Water Treatment,
W75-10351 5B

WECHSLER, R.
Domestic Waste Water Reuse--Aspects of the Treatment System,
W75-10708 5D

WEIDENSAUL, T. C.
Importance of Plants in Oxygen Production, Carbon Dioxide Consumption and Air Purification,
W75-10715 2I

WEINBERGER, L. W.
Oil Reuse--A National Need,
W75-10740 5D

WEINER, J.
Toxicity of Pulping Wastes to Fish,
W75-10403 5C

WEINSTEIN, N. J.
The Economics of Re-Refining,
W75-10757 5G

WEISS, A. D.
Developing Regional Stochastic Data Bases,
W75-10528 2E

WELCH, N. H.
Sediment-Yield Characteristics from Unit Source Watersheds,
W75-10848 2J

WELLS, J. V. B.
Report on the River Master of the Delaware River for the Period December 1, 1973-November 30, 1974,
W75-10589 4A

WELLS, W. N.
Rate of Phosphorus Uptake by Activated Sludge,
W75-10839 5D

WEST, S. W.
Summary Appraisals of the Nation's Ground-Water Resources--Rio Grande Region,
W75-10597 4B

WESTERHHAGEN, H.
Combined Effects of Cadmium and Salinity on Development and Survival of Herring Eggs,
W75-10704 5C

WESTLIN, P. R.
Environmental Problems Associated with the Use of Cooling Towers,
W75-10671 5D

WETHERILL, G. W.
Lead Metabolism in the Normal Human: Stable Isotope Studies,
W75-10484 5A

WETZLER, T. F.
Listeria in Aquatic Animals,
W75-10375 2I

WHALIN, R. W.
Lake Erie International Jetport Model Feasibility Investigation, Physical Model Feasibility Study,
W75-10670 8B

WHITE, L. J.
The Laws and Their Enforcement; Progress Amidst Problems,
W75-10607 5G

WHITE, R. K.
Sludge Disposal on Agricultural Soil,
W75-10674 5D

WHITLOCK, C. H.
Wave Climate Model of the Mid-Atlantic Shelf and Shoreline (Virginian Sea), Model Development, Shelf Geomorphology, and Preliminary Results,
W75-10552 2L

WICHARD, W.
X-ray Microanalysis of Zinc and Iron in the Cheloride Cells of Mayfly Larvae of the River Sulz, (Rontgenmikroanalyse von Zink und Eisen in Chloridzellen von Eintagsfligenlarven aus der Sulz),
W75-10416 5A

WIERSMA, D.
Operational Value of Weather Information in Relation to Soil Management Characteristics,
W75-10367 2G

WIGEN, S. O.
Some Features of Tsunamis on the Pacific Coast of South and North America,
W75-10554 2L

WILCOX, R.
A Program for Handling Emergency Oil Spillages in the Port of Baltimore,
W75-10755 5G

WILLIAMS, B. R.
Quality Products from Used Petroleum Oils,
W75-10756 5D

WILLIAMS, J. O.
Impacts of Rural to Urban Water Use,
W75-10772 6D

WILLIAMS, K.
The Snowy Torrents: Avalanche Accidents in the United States 1967-71,
W75-10657 2C

WILSON, D. F.
Organic Compounds in Pulp Mill Lagoon Discharge,
W75-10402 5D

WILSON, J. R.
Organic Compounds in Pulp Mill Lagoon Discharge,
W75-10402 5D

WINTER, H.
Principles of Establishing Sewer Systems in the Rural Settlements of Magdeburg County (Grundlagen fuer die Abwasser-Technische Erschliessung von Landgemeinden im Bezirk Magdeburg),
W75-10833 5D

WINTERS, K.
The Effects of a No. 2 Fuel Oil and Two Crude Oils on the Growth and Photosynthesis of Microalgae,
W75-10436 5C

WISER, E. H.
A Precipitation Data Simulator Using a Second Order Autoregressive Scheme,
W75-10513 2B

WITHEROW, J. L.
Analysis of Wastewater Treatment Systems for a Meat Processing Plant,
W75-10687 5D

WITHERSPOON, P. A.
Seepage from Recharge and Landfill Ditches,
W75-10770 5B

WOOLHISER, D.
Stochastic Model of Daily Rainfall,
W75-10520 2B

WOOLHISER, D. A.
A Stochastic Model of Sediment Yield for Ephemeral Streams,
W75-10524 2J

YAKOWITZ, S. L.
Statistical Inference on Streamflow Processes with Markovian Characteristics,
W75-10525 2E

YANAGISAWA, M.
Spectroscopic Determination of Atomization Efficiency (CuCl-Cu+Cl) in an Air-Hydrogen Flame,
W75-10498 2K

YARBROUGH, M. M.
Industrial Interdependencies and External Diseconomies of Water Resources,
W75-10358 6B

YATES, R.
The Lower Colorado River: A Bibliography,
W75-10453 10C

YOUNG, T. W.
Responses of 'Bearss' Lemon to Nitrogen, Potassium and Irrigation Applications,
W75-10714 3F

ZAGRODZKI, S.
Automatic Device for the Operational Control of the Filtration Rate of Suspensions(Automatische Vorrichtung zur Technischen Kontrolle der Filtrationsgeschwindigkeit von Suspensionen),
W75-10830 5D

ZDRAZILEK, J.
Sensitivity of Human Diploid Embryonic Lung Cells from Isolation of Echo Viruses from Sewage,
W75-10836 5C

ZEEMAN, M. G.
DDT : Short Term Effects on Osmoregulation in Black Surfperch (Embiotoca Jacksoni),
W75-10429 5C

ZEMANSKY, G. M.
Removal of Trace Metals During Conventional Water Treatment,
W75-10501 5F

ZENONE, C.
Icings Along the Trans-Alaska Pipeline Route,
W75-10592 2C

ZITKO, V.
Thallium: Occurrence in the Environment and Toxicity to Fish,
W75-10449 5C

ORGANIZATIONAL INDEX

ACADEMIA SINICA, TAIPEI (TAIWAN). INST. OF ZOOLOGY.
Effects of Heavy Metals and Pesticides on the Mass Mortalities of Cultured Shellfishes Along the Southwest Coast of Taiwan, (In Chinese),
W75-10427 5C

AGRICULTURAL RESEARCH AND EDUCATIONAL CENTER, LAKE ALFRED, FLA.
Responses of 'Bearss' Lemon to Nitrogen, Potassium and Irrigation Applications,
W75-10714 3F

AGRICULTURAL RESEARCH SERVICE, BELTSVILLE, MD. HYDROGRAPH LAB.
Cross Spectra of Short-Duration Rainfall,
W75-10514 2B

AGRICULTURAL RESEARCH SERVICE, CHICKASHA, OKLA.
General Aspects of Multivariate Analysis with Applications to Some Problems in Hydrology,
W75-10510 2A

Stochastic Generation of the Occurrence, Pattern, and Location of Maximum Amount of Daily Rainfall,
W75-10516 2B

ACTMO, An Agricultural Chemical Transport Model,
W75-10846 5B

Total Sediment Load by the Extrapolated Data Procedure,
W75-10847 2J

Sediment-Yield Characteristics from Unit Source Watersheds,
W75-10848 2J

AGRICULTURAL RESEARCH SERVICE, FORT COLLINS, COLO.
A Stochastic Model of Sediment Yield for Ephemeral Streams,
W75-10524 2J

Effectiveness of Precipitation in a Mountain Meadow,
W75-10799 2D

AGRICULTURAL RESEARCH SERVICE, MANDAN, N. DAK. NORTHERN GREAT PLAINS RESEARCH CENTER.
Drainage Analysis of a Confining Formation,
W75-10780 4A

AGRICULTURAL RESEARCH SERVICE, PHOENIX, ARIZ. WATER CONSERVATION LAB.
Trickle Irrigation Design Requirements for Row Crops,
W75-10801 3F

AGRICULTURAL RESEARCH SERVICE, RIVERSIDE, CALIF. SALINITY LAB.
Irrigation Management for Salt Control,
W75-10800 3C

AGRICULTURAL RESEARCH SERVICE, STONEVILLE, MISS. SOUTH WEED SCIENCE LAB.
Adsorption and Degradation of Chlorbromuron in Soil,
W75-10414 5B

Prediction of Trifluralin Diffusion Coefficients,
W75-10542 5B

AGRICULTURAL RESEARCH SERVICE, TUCSON, ARIZ. SOUTHWEST WATERSHED RESEARCH CENTER.
Stochastic Models of Spatial and Temporal Distribution of Thunderstorm Rainfall,
W75-10519 2B

AGRICULTURAL RESEARCH SERVICE, WASHINGTON, D.C.
Proceedings Symposium on Statistical Hydrology.
W75-10507 2A

AICHI PREFECTURE FISHERIES EXPERIMENTAL STATION, MIYA (JAPAN).
Experimental Investigation on the Biological Concentration of Mercury-I. On the Rate of Mercury Transfer Through the Food Chain From Jack Mackerel to Young Yellowtail (In Japanese),
W75-10441 5C

AIRCO, INC., MONTVALE, N.J. (ASSIGNEE)
Multiple Cycle Process for Wastewater Purification,
W75-10738 5D

ALASKA UNIV., COLLEGE. INST. OF SOCIAL, ECONOMIC, AND GOVERNMENT RESEARCH.
Processes and Costs Imposed by Environmental Stress,
W75-10461 2C

ALBERTA UNIV., EDMONTON. DEPT. OF CIVIL ENGINEERING.
Large Scale Laboratory Direct Shear Tests on Ice,
W75-10502 2C

ALL-UNION RESEARCH INST. OF SEA FISHERIES AND OCEANOGRAPHY, MOSCOW (USSR).
The Effect of Different Salinities and Manganese Ion on the Survival Respiration of the Baltic Flounder (Pleuronectes Flesus Trachurus (Dunker)) of the Gulf of Riga,
W75-10411 5C

ALYESKA PIPELINE SERVICE CO., BELLEVUE, WASH.
800 Miles to Go,
W75-10638 5C

AMERICAN BIOCULTURE, INC., PHOENIX, ARIZ. RESEARCH LAB.
Effect of a Phytoplankton Culture on the Germination and Seedling Development of Barley, Sugar Beets and Lettuce,
W75-10496 3F

AMERICAN PETROLEUM INST., NEW YORK. TASK FORCE ON UTILIZATION OF WASTE LUBRICATING OILS.
Waste Lubricating Oil Characteristics--Do They Vary Geographically, Seasonally, and With Origin,
W75-10746 5B

AMERICAN SOCIETY OF CIVIL ENGINEERS, NEW YORK.
Agricultural and Urban Considerations in Irrigation and Drainage.
W75-10769 4A

ARCTIC INST. OF NORTH AMERICA, MONTREAL (QUEBEC).
Review of Development of Arctic Resources,
W75-10462 2C

ARIZONA STATE UNIV., TEMPE. DEPT. OF GEOLOGY.
Geomorphic Processes in Polar Deserts,
W75-10456 2C

ARIZONA UNIV., TUCSON.
Methodological Problems in Applying the Straw Man to Real Life Problems,
W75-10814 6A

ARIZONA UNIV., TUCSON. DEPT. OF AGRONOMY AND PLANT GENETICS.
Some Effects of Field Weathering of Seed Cotton in a Desert Environment,
W75-10557 3F

ARIZONA UNIV., TUCSON. DEPT. OF MATHEMATICS.
Statistical Inference on Streamflow Processes with Markovian Characteristics,
W75-10525 2E

ARIZONA UNIV., TUCSON. DEPT. OF WATERSHED MANAGEMENT.
An Event-Based Stochastic Model of Areal Rainfall and Runoff,
W75-10521 2B

ARIZONA WESTERN COLL., YUMA.
The Lower Colorado River: A Bibliography,
W75-10453 10C

ARKHANGELSK KOMBINAT (USSR).
Reduction of Effluent Pollution at the Arkhangel'sk Mills (Snizhenie zagryaznennosti stochnykh vod na Arkhangel'-skom Kombinate),
W75-10368 5D

ARMY ENGINEER DISTRICT, BALTIMORE.
Flood Plain Information: Mill Run, Blair County, Pennsylvania.
W75-10568 4A

ARMY ENGINEER DISTRICT, BALTIMORE, MD.
Flood Plain Information: Bloomsburg, Columbia County, Pennsylvania-Susquehanna River.
W75-10561 4A

Flood Plain Information Report: Seneca Creek, Montgomery County, Maryland.
W75-10567 4A

Flood Plain Information: West Branch Susquehanna River, Lycoming County, Pennsylvania.
W75-10576 4A

ARMY ENGINEER DISTRICT, CHICAGO, ILL.
Flood Plain Information: Macon County, Illinois.
W75-10565 4A

ARMY ENGINEER DISTRICT, DETROIT, MICH.
Flood Plain Information: Upper River Rouge, Minnow Pond Drain, Bell Branch and Tarabusi Creek, Wayne and Oakland Counties, Michigan.
W75-10575 4A

ARMY ENGINEER DISTRICT, KANSAS CITY, MO.
Harry S. Truman Dam and Reservoir, Osage River, Missouri, Apendix A (Final Environmental Impact Statement).
W75-10363 8A

Flood Plain Information: East Fork One Hundred and Two River, Bedford, Iowa.
W75-10566 4A

ARMY ENGINEER DISTRICT, MOBILE, ALA.
Special Flood Hazard Information Report: Chickasawhay River, Waynesboro, Wayne County, Mississippi.
W75-10569 4A

Flood Plain Information: Catoma Creek, Vicinity of Montgomery, Alabama.
W75-10574 4A

ARMY ENGINEER DISTRICT, NORFOLK, VA.
Flood Plain Information: Meadow Creek, Albemarle County and Charlottesville, Virginia.
W75-10564 4A

Flood Plain Information: Falling Creek, Chesterfield County, Virginia.
W75-10577 4A

Flood Plain Information: James River, Eagle Rock to Lick Run, Botetourt County, Virginia.
W75-10578 4A

Flood Plain Information: Johnson Creek and Tributary, Chesterfield County, Virginia.
W75-10579 4A

ARMY ENGINEER DISTRICT, OMAHA, NEB.
Flood Plain Information: Brookings, Brookings County, South Dakota, Volume I - Deer Creek.
W75-10570 4A

ARMY ENGINEER DISTRICT, OMAHA, NEBR.
Flood Plain Information: Goldsmith Gulch, Dutch Creek, Lilley Gulch, and Coon Creek, Volume VI, Denver Metropolitan Region, Colorado.
W75-10563 4A

ARMY ENGINEER DISTRICT, PHILADELPHIA, PA.
Flood Plain Information: Bushkill Creek, Vicinity of Easton, Pennsylvania.
W75-10560 4A

Flood Plain Information: Brandywine Creek, Chester County, Pennsylvania.
W75-10562 4A

Flood Plain Information: White Clay Creek, New Castle County, Delaware.
W75-10571 4A

Flood Plain Information: Shabakunk Creek, West Branch Shabakunk and Little Shabakunk Creeks, Mercer County, New Jersey.
W75-10572 4A

ARMY ENGINEER DISTRICT, VICKSBURG, MISS.
Flood Plain Information: Ouachita River, Hot Springs Creek, Stokes Creek, Molly Creek, Gulpha Creek, City of Hot Springs, Arkansas.
W75-10559 4A

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, LIVERMORE, CALIF. EXPLOSIVE EXCAVATION RESEARCH LAB.
Project Lost Creek: Field Tests of Mounding and Controlled Blasting,
W75-10553 8H

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, LIVERMORE, CALIF. EXPLOSIVE EXCAVATIONS RESEARCH LAB.
Results of Airblast Overpressure Measurement Program at Project R.D. Bailey,
W75-10555 8H

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS.
A Numerical Model for Predicting the Effects of Landslide-Generated Water Waves,
W75-10661 8A

Norton Point Dike Study, Coney Island, New York; Hydraulic Model Investigation,
W75-10662 8B

Waimano Stream Flood Control Project, Pearl City, Hawaii; Hydraulic Model Investigation,
W75-10663 8B

Los Angeles and Long Beach Harbors Model Study; Report 2, Observations of Ship Mooring and Movement,
W75-10664 8B

Spillway for Burnsville Dam, Little Kanawha River, West Virginia; Hydraulic Model Investigation,
W75-10665 8B

Turbulent Flow in Rectangular Outlet Conduit, Rend Lake Dam, Big Muddy River, Illinois,
W75-10666 8B

Navigation Conditions at Cannelton Locks and Dam, Ohio River; Hydraulic Model Investigation,
W75-10667 8B

Flood Control Project on Lytle and Warm Creeks and Santa Ana River, California; Hydraulic Model Investigation,
W75-10668 8B

Evaluation of Disposal Areas in James River; Hydraulic Model Investigation,
W75-10669 8B

Lake Erie International Jetport Model Feasibility Investigation, Physical Model Feasibility Study,
W75-10670 8B

ASSOCIATION OF PETROLEUM RE-REFINERS, WASHINGTON, D.C.
Proceedings of the International Conference on Waste Oil Recovery and Reuse.
W75-10739 5D

ASTON UNIV., BIRMINGHAM (ENGLAND). DEPT. OF BIOLOGICAL SCIENCES.
Toxic Effects of an Anionic Detergent on the Gills of Rainbow Trout,
W75-10434 5C

AUBURN UNIV., ALA. DEPT. OF FISHERIES AND ALLIED AQUACULTURES.
Essentiality of Vitamin C in Feeds for Intensively Fed Caged Channel Catfish,
W75-10362 8I

AUBURN UNIV., ALABAMA. DEPT. OF ECONOMICS.
Theoretical and Applied Concepts of Water Resources for Social Welfare.
W75-10354 6B

Principles and standards for Water Planning,
W75-10355 6B

The Economic Impact of Mercury Pollution on Fisheries and Other Related Businesses Around Pickwick Lake,
W75-10356 5G

International Production Aspects of Water and Environmental Quality Control,
W75-10357 5G

Industrial Interdependencies and External Diseconomies of Water Resources,
W75-10358 6B

AUSTRALIAN INST. OF MARINE SCIENCES, TOWNSVILLE.
The Concentration of Mercury, Copper, Nickel, Silver, Cadmium and Lead in the Northern Adriatic Anchovy, Engraulis Encrasicholus, and Sardine, Sardina Pilchardus,
W75-10620 5B

B.C. RESEARCH LTD., VANCOUVER.
Effect of Temperature and Sludge Loading on 5-Day BOD Removal and Sludge Settleability in Activated Sludge Systems Treating Bleached Kraft Effluents,
W75-10379 5D

B.C. RESEARCH LTD., VANCOUVER. DIV. OF APPLIED BIOLOGY.
Swimming Performance of Juvenile Coho Salmon (Oncorhynchus Kisutch) Exposed to Bleached Kraft Pulp Mill Effluent,
W75-10387 5C

Effects of Acute Exposure to Bleached Kraft Pulp Mill Effluent on Carbohydrate Metabolism of Juvenile Coho Salmon (Oncorhynchus Kisutch) During Rest and Exercise.
W75-10388 5C

Rotating Biological Disk Treatment of Kraft Mill Effluents,
W75-10390 5D

BALLISTIC MISSILE DEFENSE SYSTEMS COMMAND FIELD OFFICE, MADISON, N.J.
The Influence Surface Method for Floating Ice Plates,
W75-10504 2C

BIOLOGISCHE ANSTALT HEIGOLAND (WEST GERMANY).
Combined Effects of Cadmium and Salinity on Development and Survival of Herring Eggs,
W75-10704 5C

BOEING COMPUTER SERVICES, INC., SEATTLE, WASH. MATHEMATICALS AND MODELING UNIT.
Computer Simulation of Water Distribution Networks,
W75-10823 4A

BOLOGNA UNIV. (ITALY). ISTITUTO DI BIOCHIMICA.
Residues of Polychlorinated Biphenyls (PCB) and Chlorinated Pesticides in Fish and Birds of the Po Delta, (Residus de Polychlorobiphenyls (PCB) et de Pesticides Chlores Dans Les Poissons et Les Oiseaux du Delta du Po),
W75-10446 5B

BRISTOL UNIV. (ENGLAND). SCHOOL OF CHEMISTRY.
Absorption of Cadmium, Copper and Zinc by Dog Whelks in the Bristol Channel,
W75-10481 5B

BRITISH COLUMBIA UNIV., VANCOUVER. DEPT. OF CIVIL ENGINEERING.
Nonlinear Channel Routing by Computer,
W75-10543 4A

BRITISH COLUMBIA UNIV., VANCOUVER. DEPT. OF FORESTRY.
Aspects of the Winter Ecology of Juvenile Coho Salmon (Oncorhynchus Kisutch) and Steelhead Trout (Salmo Gairdneri),
W75-10615 5C

BRITISH COLUMBIA UNIV., VANCOUVER. DEPT. OF GEOLOGICAL SCIENCES.
Snow Creep: Its Engineering Problems and Some Techniques and Results of Its Investigation,
W75-10503 2C

Glacier-Flow Patterns and the Origin of Late Wisconsinan Till in the Southern Rocky Mountain Trench, British Columbia,
W75-10539 2C

BUNDESFORSCHUNGSANSTALT FUER FISCHEREI, HAMBURG (WEST GERMANY). INSTITUT FUER KUESTEN- UND BINNEN-FISCHEREI.
Effect of a Mixture of Succinic Acid Mono-Sulpho-Ester and Olefin Sulfonate on Fish (Uber die Wirkung einer Mischung von Sulfobernsteinsaure-halbester und Olefinsulfonat auf Fische),
W75-10409 5C

BUNDESFORSCHUNGSANSTALT FUER FISCHEREI, HAMBURG (WEST GERMANY). ISOTOPENLABORATORIUM.
Determination of the Transition Metals Manganese, Iron, Cobalt, Copper and Zinc in River Fishes With Help of X-Ray Fluorescence Analysis and Flameless Atomic Absorption Spectroscopy, (Bestimmung der Ubergangsmetalle Mangan, Eisen, Kobalt, Kupfer und zink in Flussfischen mit Hilfe der Rontgenfluores-zenzanalyse und der flammenlosen Atomabsorption),
W75-10408 5A

On the Accumulation of Organochlorine Pesticides, PCB and Certain Heavy Metals in Fish and Shellfish from Thai Coastal and Inland Waters,
W75-10616 5B

BUREAU OF RECLAMATION, AURORA, COLO.
Change in Quality of Pumped Drainage Effluent,
W75-10779 5B

BUREAU OF RECLAMATION, DENVER, COLO.
Current Water Systems Automation Research and Development in the Bureau of Reclamation,
W75-10787 8C

BUREAU OF SPORT FISHERIES AND WILDLIFE, COLUMBIA, MO. FISH-PESTICIDE RESEARCH LAB.
Toxaphene Effects on Growth and Development of Brook Trout (Salvelinus Fontinalis),
W75-10621 5C

Toxicity and Residue Dynamics of the Lampricide 3-Trifluoro-Methyl-4-Nitrophenol (TFM) in Aquatic Invertebrates,
W75-10700 5C

BUREAU OF SPORT FISHERIES AND WILDLIFE, LA CROSSE, WIS. FISH CONTROL LAB.
Toxicity of Paired Mixtures of Candidate Forest Insecticides to Rainbow Trout,
W75-10439 5C

Effects of pH on Toxicity of Antimycin to Fish,
W75-10450 5C

BUREAU OF SPORT FISHERIES AND WILDLIFE, LACROSSE, WIS. FISH CONTROL LAB.
Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) to the Nontarget Fish in Static Tests,
W75-10701 5C

Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) To Nontarget Fish in Flow- Through Tests,
W75-10702 5C

BUREAU OF SPORT FISHERIES AND WILDLIFE, LAUREL MD. PATUXENT WILDLIFE RESEARCH CENTER.
Effects of Methylmercury on Approach and Avoidance Behavior of Mallard Ducklings,
W75-10424 5C

BUREAU OF SPORT FISHERIES AND WILDLIFE, WARM SPRINGS, GA. SOUTHEASTERN FISH CONTROL LAB.
Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitrophenol (TFM) to Selected Aquatic Invertebrates and Frog Larvae,
W75-10703 5C

CALGARY UNIV., ALBERTA. DEPT. OF GEOGRAPHY.
Some Aspects of Climatology in Polar Barrens,
W75-10454 2C

CALIFORNIA POLYTECHNIC STATE UNIV., SAN LUIS OBISPO. DEPT. OF AGRICULTURAL ENGINEERING.
Float Valve Provides Variable Flow Rates at Low Pressures,
W75-10789 8C

CALIFORNIA STATE DEPT. OF WATER RESOURCES, SACRAMENTO.
Evaluation of Ground Water Resources: Sacramento County,
W75-10546 2F

CALIFORNIA STATE UNIV., HUMBOLDT, ARCATA. SCHOOL OF NATURAL RESOURCES.
Listeria in Aquatic Animals,
W75-10375 2I

CALIFORNIA STATE UNIV., NORTHRIDGE. DEPT. OF BIOLOGY.
The Effect of Crude Oil Fractions on the Survival of a Tidepool Copepod, Tigriopus Californicus,
W75-10641 5C

CALIFORNIA UNIV., BERKELEY.
Water Rates: An Assessment of Current Issues,
W75-10707 6C

CALIFORNIA UNIV., BERKELEY. DEPT. OF GEOLOGICAL ENGINEERING.
Seepage from Recharge and Landfill Ditches,
W75-10770 5B

CALIFORNIA UNIV., BERKELEY. SANITARY ENGINEERING RESEARCH LAB.
Suppression of Nitrogen Fixation by Blue-Green Alage in a Eutrophic Lake with Trace Additions of Copper,
W75-10480 5C

CALIFORNIA UNIV., DAVIS.
Activated Sludge,
W75-10371 5D

CALIFORNIA UNIV., DAVIS. DEPT. OF AGRONOMY AND RANGE SCIENCE.
Characterization of Cadmium Uptake by Plant Tissue,
W75-10479 5B

CALIFORNIA UNIV., DAVIS. DEPT. OF FOOD SCIENCE AND TECHNOLOGY.
Effect of Dietary Selenium on Glutathione Peroxidase in the Chick,
W75-10495 5A

CALIFORNIA UNIV., DAVIS. HYDRAULICS LAB.
Some Factors Affecting Control of Flow in a Large Canal System,
W75-10786 8B

CALIFORNIA UNIV., LOS ANGELES. COLL. OF ENGINEERING.
Problems of Water Quality Management in Western River Basin Systems,
W75-10804 5G

CALIFORNIA UNIV., LOS ANGELES. INST. OF GEOPHYSICS AND PLANETARY PHYSICS.
Lead Metabolism in the Normal Human: Stable Isotope Studies,
W75-10484 5A

CALIFORNIA UNIV., RIVERSIDE.
Methodological Application of the Straw Man Decision Structure to a Hypothetical Case: The Dorfman-Jacoby Water Quality Model,
W75-10811 6A

Social Indicators and Connectives,
W75-10812 6A

Qualitative Sign Matrix Manipulation,
W75-10815 6A

CALIFORNIA UNIV., RIVERSIDE. DEPT. OF ENTOMOLOGY.
Biological Activity of Organophosphorus Compounds and Synthetic Pyrethroids Against Immature Mosquitoes,
W75-10631 5G

CALIFORNIA UNIV., RIVERSIDE. DEPT. OF PHILOSOPHY.
Comments on the Straw Man,
W75-10808 6B

CALIFORNIA UNIV., RIVERSIDE. PROGRAM IN ENVIRONMENTAL ECONOMICS.
Panel Review of the Taxonomic Structure of the Straw Man.
W75-10806 6B

Proceedings of the Graduate Student Symposium of the Technical Committee of the Water Resources Centers of the Thirteen Western States.
W75-10810 6A

CALIFORNIA UNIV., RIVERSIDE. TECHNICAL COMMITTEE OF THE WATER RESOURCES CENTERS OF THE THIRTEEN WESTERN STATES.
Panel Evaluation of the Logical Structure, Consistency, and Underlying Assumptions of the 'Strawman' Methodology.
W75-10807 6B

CALIFORNIA UNIV., SANTA BARBARA.
Political Participation and Water Rates. A Closer Look,
W75-10361 6C

CANADA CENTRE FOR INLAND WATERS, BURLINGTON (ONTARIO).

CANADA CENTRE FOR INLAND WATERS, BURLINGTON (ONTARIO).
Influence of a Thermal Effluent on Movement of Brown Bullhead (Ictalurus Nebulosus) as Determined by Ultrasonic Tracking,
W75-10628 5C

CELOTEX CORP., LAGRO, IND.
Disposal of Liquid Effluent by Land Irrigation at Lagro Celotex Plant,
W75-10679 5D

CENTRAL AND SOUTHERN FLORIDA FLOOD CONTROL DISTRICT, WEST PALM BEACH.
A Stochastic Model for Daily Rainfall Data Synthesis,
W75-10518 2B

CENTRAL NEBRASKA PUBLIC POWER AND IRRIGATION DISTRICT, HOLDREGE.
Groundwater Control by Pumping,
W75-10778 4B

CENTROS DE ESTUDIOS, INVESTIGACIONES Y APLICACIONES DEL AGUA, GRANADA (SPAIN).
New Legislative Tendencies for Control of Water Pollution (Nuevas tendencias legislativas en el control de la contaminacion de las aguas),
W75-10384 5G

CH2M/HILL, PORTLAND, OREG.
Groundwater Model as a Tool in Planning and Management,
W75-10781 4B

CHALMERS UNIV. OF TECHNOLOGY, GOTEBORG (SWEDEN). DEPT. OF CHEMICAL ENGINEERING.
Spent Liquor From Peroxide Bleaching of Groundwood Pulp From Spruce,
W75-10392 5A

CLARK UNIV., WORCESTER, MASS.
Water Supply from Renovated Wastewater--A Resource Manual for Massachusetts Planners, Public Officials and Citizen Groups.
W75-10722 5D

CLARK UNIV., WORCESTER, MASS. GRADUATE SCHOOL OF GEOGRAPHY.
On the Peak-Load Pricing of Urban Water Supply,
W75-10706 6C

CLEMSON UNIV., S.C. DEPT. OF ENVIRONMENTAL SYSTEMS ENGINEERING.
Reclamation of Textile Printing Wastewaters for Direct Recycle,
W75-10676 5D

COAST GUARD, WASHINGTON, D.C.
Characteristics of Oil Pollution in and Around U.S. Waters,
W75-10754 5B

COAST GUARD, WASHINGTON, D.C. OFFICE OF MARINE ENVIRONMENT AND SYSTEMS.
USCG Sets Broader Use of Pollution Control Systems,
W75-10466 5G

COLORADO STATE UNIV., FORT COLLINS.
Role of the Public in Weather Modification,
W75-10777 3B

Towards a Sharper Concept of an Action Variable,
W75-10813 6A

Necessary Adaptations for Significant Utilization of the Information System,
W75-10816 6A

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF ATMOSPHERIC SCIENCE.
Priority Problems for Modifying Cumulus Precipitation,
W75-10774 3B

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF CIVIL ENGINEERING.
Stochastic Model of Daily Rainfall,
W75-10520 2B

Research in Stochastic Models for Bedload Transport,
W75-10522 2J

Dispersion of Contaminated Bedload Particles,
W75-10526 5B

COLORADO UNIV., BOULDER. DEPT. OF CIVIL AND ENVIRONMENTAL ENGINEERING.
Vacuum Filtration Cost Optimization,
W75-10681 5D

COLORADO UNIV., BOULDER. DEPT. OF GEOGRAPHY; AND COLORADO UNIV., BOULDER. INST. OF ARCTIC AND ALPINE RESEARCH.
A Climatological Analysis of North Polar Desert Areas,
W75-10455 2C

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, GRIFFITH (AUSTRALIA). DIV. OF IRRIGATION RESEARCH.
Predicting the Concentration of Aquatic Herbicide Residues in Waterways,
W75-10648 5B

CONNECTICUT UNIV., NOANK. MARINE RESEARCH LAB.
The Effect of Prolonged Exposure to Elevated Temperatures on the Biochemical Constituents, Gonadal Development and Shell Deposition of the American Oyster, Crassostrea Virginica,
W75-10849 5C

CONSERVATION SERVICE, TEMPLE, TEX.
Effects of Surface Drainage on Stream Flow,
W75-10794 4A

COUNCIL ON THE ENVIRONMENT OF NEW YORK CITY.
Waste Oil: The Recapture of an Energy Resource (The Generation, Disposal and Recovery of Waste Oil in the New York Metropolitan Area),
W75-10745 5D

DELAWARE UNIV., NEWARK. DEPT. OF CIVIL ENGINEERING.
Waste Water Treatment: Sludge Treatment, Utilization, and Disposal,
W75-10395 5D

DEPARTMENT OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT, OTTAWA (ONTARIO).
Indigenous Peoples of Polar Deserts,
W75-10460 6D

DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO).
Disposal of Used Crankcase and Other Oils in Canada,
W75-10743 5D

DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). INLAND WATERS DIRECTORATE.
A Remote Sensing Laser Fluorometer,
W75-10831 5A

DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). MARINE SCIENCES DIRECTORATE.
Some Features of Tsunamis on the Pacific Coast of South and North America,
W75-10554 2L

DIAZ, SECKINGER AND ASSOCIATES, INC., TAMPA, FLA.
New Concepts in Suburban Drainage in Florida,
W75-10793 4A

DOSHISHA UNIV., KYOTO (JAPAN). BIOLOGICAL LAB.
Marine Pollution Bioassay by Sea Urchin Eggs, An Attempt to Enhance Accuracy,
W75-10419 5A

Bioassay Data for Marine Pollution Using Sea Urchin Eggs, 1972 and 1973,
W75-10432 5A

DOW CHEMICAL CO., MIDLAND, MICH.
Color Removal From Bleached Kraft Effluents,
W75-10399 5D

DUKE UNIV., DURHAM, N.C. DEPT. OF ZOOLOGY.
Effects of Mirex on the Larval Development of Blue Crab,
W75-10410 5C

DVFRESNE-HENRY ENGINEERING CORP., NORTH SPRINGFIELD, VT.
Water Works Improvements--Springfield, Vermont,
W75-10713 3D

EDISON WATER QUALITY RESEARCH LAB., N.J.
Runoff of Oils from Rural Roads Treated to Suppress Dust,
W75-10766 5B

EL PASO SOUTHERN CO., TEX. (ASSIGNEE)
Air and Water Pollution Control,
W75-10732 5D

ENVIRONMENTAL CONTROL TECHNOLOGY CORP., ANN ARBOR, MICH.
Analysis of Pollution from Marine Engines - Status Report,
W75-10688 5A

ENVIRONMENTAL PROTECTION AGENCY, GULF BREEZE, FLA. GULF BREEZE ENVIRONMENTAL RESEARCH LAB.
A Gravity-Flow Column to Provide Pesticide-Laden Water for Aquatic Bioassays,
W75-10844 5A

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C.
Waste Oil Management--The Environmental Protection Agency's Role,
W75-10742 5G

Health Implications of Exposure to Trace Metals from Combustion of Waste Oil,
W75-10765 5C

The Waste Oil Industry: A Discussion of Some Issues to Consider in Performing an Economic Analysis,
W75-10767 5G

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. OFFICE OF FEDERAL ACTIVITIES.
Manual for Preparation of Environmental Impact Statements for Wastewater Treatment Works, Facilities Plans, and 208 Areawide Waste Treatment Management Plans,
W75-10473 5D

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W75-10396 5D

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W75-10475 5D

ENVIRONMENTAL PROTECTION SERVICE, OTTAWA (ONTARIO). WATER POLLUTION CONTROL DIRECTORATE.
An Effluent Study of a Fresh Water Fish Processing Plant,
W75-10684 5D

ENVIRONMENTAL QUALITY SYSTEMS, INC., ROCKVILLE, MD.
Oil Reuse--A National Need,
W75-10740 5D

Oily Bilge from Commercial Vessels,
W75-10752 5B

Pollution Control with a Comprehensive Waste Oil Processing Plant,
W75-10758 5D

An Economic Model of Waste Oil Recovery, Reprocessing and Distribution Systems,
W75-10768 5D

FARBWERKE HOECHST, FRANKFURT AM MAIN (WEST GERMANY).
Devices for Toxicological Long-Term Studies on Aquatic Organisms (Gerate zur Durchfuhrung Toxikologischer Langzeitstudien an Wasserorganismen),
W75-10618 5A

FISH AND WILDLIFE SERVICE, FORT WORTH, TEX. DIV. OF RIVER BASIN STUDIES.
The Drift of Mayflies (Ephemeroptera) in the Brazos River, Texas,
W75-10558 5B

FISHERIES AND MARINE SERVICE, VANCOUVER (BRITISH COLUMBIA). VANCOUVER LAB.
Corticosteroid Concentrations in Sockeye Salmon (Oncorhynchus Nerka) Exposed to Low Concentrations of Copper,
W75-10415 5C

Acute Toxicity of Kanamycin to Steelhead Trout (Salmo Gairdneri),
W75-10423 5C

FISHERIES AND MARINE SERVICE, WEST VANCOUVER (BRITISH COLUMBIA). PACIFIC ENVIRONMENT INST.
The Biological Half-Life of Inorganic Mercury in the Dungeness Crab (Cancer magister),
W75-10437 5C

FISHERIES RESEARCH BOARD OF CANADA, ST. ANDREWS (NEW BRUNSWICK). BIOLOGICAL STATION.
Toxicity of Phosphamidon to American Lobsters (Homarus Americanus) Held at 4 and 12C,
W75-10413 5C

Thallium: Occurrence in the Environment and Toxicity to Fish,
W75-10449 5C

FISHERIES RESEARCH BOARD OF CANADA, WINNIPEG (MANITOBA). FRESHWATER INST.
Analysis of Tri-Aryl Phosphate Esters and the Determination of Imol S-140 in Fish Tissue and Water Samples by Gas Chromatography,
W75-10442 5A

FLORIDA UNIV., GAINESVILLE. SCHOOL OF FOREST RESOURCES AND CONSERVATION.
Utilization of a Kraft Effluent Channel by Fish and Aquatic Organisms,
W75-10377 5C

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, ROME (ITALY). EUROPEAN INLAND FISHERIES ADVISORY COMMISSION.
Water Quality Criteria for European Fresh-Water Fish.
W75-10609 5C

Water Quality Criteria for European Fresh-water Fish.
W75-10610 5C

FOREST SERVICE (USDA), BERKELEY, CALIF. PACIFIC SOUTHWEST FOREST AND RANGE EXPERIMENT STATION.
A Model of Statistical Errors in Estimating Streamflow from Continuous-Stage Records,
W75-10512 2E

FOREST SERVICE (USDA), FORT COLLINS, COLO. ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION.
Land Use Simulation Model of the Subalpine Coniferous Forest Zone,
W75-10404 3B

Watershed Management in the Rocky Mountain Subalpine Zone: The Status of Our Knowledge,
W75-10405 3B

Simulating Timber Yields and Hydrologic Impacts Resulting From Timber Harvest on Subalpine Watersheds,
W75-10406 3B

Analog Temperature Records from a Linearized Thermistor Network,
W75-10650 7B

A Weibull Prediction of the Tensile Strength-Volume Relationship of Snow,
W75-10651 2C

An Automatic Data Acquisition and Reduction System,
W75-10652 7A

Avalanche Warnings: Content and Dissemination,
W75-10653 2C

Canopy Weight Distribution Affects Windspeed and Temperature in a Lodgepole Pine Forest,
W75-10654 4A

Watershed Management Problems and Opportunities for the Colorado Front Range Ponderosa Pine Zone: The Status of Our Knowledge,
W75-10655 4D

Avalanche Protection in Switzerland.
W75-10656 8C

The Snowy Torrents: Avalanche Accidents in the United States 1967-71,
W75-10657 2C

Snow Avalanche Sites: Their Identification and Evaluation,
W75-10659 2C

Water-Yield Improvement from Alpine Areas: The Status of Our Knowledge,
W75-10660 3B

FOREST SERVICE (USDA), LARAMIE, WYO. ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION.
New Engineering Criteria for Snow Fence Systems,
W75-10692 2C

New Snow Fence Design Controls Drifts, Improves Visibility, Reduces Road Ice,
W75-10693 2C

Estimating the Transport and Evaporation of Blowing Snow,
W75-10695 2C

FOREST SERVICE (USDA), WENATCHEE, WASH. FOREST HYDROLOGY LAB.
Watershed Behavior After Forest Fire in Washington,
W75-10790 4C

FOURAH BAY COLL., FREETOWN (SIERRA LEONE). INST. OF MARINE BIOLOGY AND OCEANOGRAPHY.
Tar Pollution of Sierra Leone Beaches,
W75-10472 5B

FRONTIER ENGINEERING CORP., HOUSTON, TEX.; AND ZACHRY (H. B.) CO., SAN ANTONIO, TEX. (ASSIGNEES)
Rotary Desalination Engine and System,
W75-10733 3A

GCA CORP., BEDFORD, MASS. GCA TECHNOLOGY DIV.
Waste Automotive Lubricating Oil as a Municipal Incinerator Fuel,
W75-10764 5D

GENERAL ELECTRIC CO., PHILADELPHIA, PA. RE-ENTRY AND ENVIRONMENTAL SYSTEMS DIV.
Feasibility Test Program of Application of Coalescing Phase Oil/Water Separators to Self Compensating Fuel Tanks in Surface Ships,
W75-10474 5G

GEOLOGICAL SURVEY, ALBUQUERQUE, N. MEX.
Ground-Water Levels in New Mexico, 1972,
W75-10582 4B

GEOLOGICAL SURVEY, ANCHORAGE, ALASKA.
Icings Along the Trans-Alaska Pipeline Route,
W75-10592 2C

Channel Erosion Surveys Along Southern Segment of the Taps Route, Alaska, 1972 and 1973,
W75-10594 8B

GEOLOGICAL SURVEY, AUSTIN, TEX.
Hydrologic Data for Urban Studies in the Fort Worth, Texas Metropolitan Area, 1973,
W75-10596 7C

GEOLOGICAL SURVEY, BATON ROUGE, LA.
Index to Water Resources Data for Louisiana: Surface Water Records; Water-Quality Records.
W75-10590 5A

GEOLOGICAL SURVEY, BOSTON, MASS.
A Comparison of Methods for Estimating Flood Peaks on Streams in Massachusetts,
W75-10587 4A

GEOLOGICAL SURVEY, CHEYENNE, WYO.
Temperatures of Wyoming Streams,
W75-10604 7C

GEOLOGICAL SURVEY, DENVER, COLO.
Uranium, Thorium, and Lead Concentrations in Three Silicate Standards and a Method of Lead Isotopic Analysis,
W75-10494 2K

GEOLOGICAL SURVEY, HARTFORD, CONN.
Hydrogeologic Data for the Farmington River Basin, Connecticut,
W75-10591 7C

GEOLOGICAL SURVEY, INDIANAPOLIS, IND.
A River-Quality Assessment of the Upper White River, Indiana,
W75-10600 5B

GEOLOGICAL SURVEY, JACKSON, MISS.
Water for Industrial Development in Alcorn, Itawamba, Prentiss, and Tishomingo Counties, Mississippi,
W75-10581 3E

Low-Flow Characteristics of Mississippi Streams,
W75-10605 2E

GEOLOGICAL SURVEY, MENLO PARK, CALIF.
Map of the Antelope Valley-East Kern Water Agency Area, California, Showing Ground-Water Subunits and Areas, Location of Wells, and Water-Level Contours for Spring 1974,
W75-10595 7C

Problems Related to Water Quality and Algal Control in Lopez Reservoir, San Luis Obispo County, California,
W75-10601 5B

GEOLOGICAL SURVEY, MIAMI, FLA.
The Loxahatchee - A River in Distress, Southeast Florida,
W75-10588 4C

GEOLOGICAL SURVEY, PARKVILLE, MD.
Hydrogeology of the Triassic Rocks of Maryland,
W75-10584 2F

GEOLOGICAL SURVEY, RALEIGH, N.C.
Sediment Characteristics of Streams in the Eastern Piedmont and Western Coastal Plain Regions of North Carolina,
W75-10586 2J

Hydrology of the Albemarle-Pamlico Region, North Carolina--A Preliminary Report on the Impact of Agricultural Developments,
W75-10602 4C

GEOLOGICAL SURVEY, RESTON, VA.
Geological and Limnological Factors of Cold Deserts,
W75-10457 2C

Report on the River Master of the Delaware River for the Period December 1, 1973-November 30, 1974,
W75-10589 4A

Summary Appraisals of the Nation's Ground-Water Resources--Rio Grande Region,
W75-10597 4B

Summary Appraisals of the Nation's Ground-Water Resources--Ohio Region,
W75-10598 4B

GEOLOGICAL SURVEY, RICHMOND, VA.
A Predictive Computer Model of the Lower Cretaceous Aquifer, Franklin Area, Southeastern Virginia,
W75-10599 2F

GEOLOGICAL SURVEY, SALT LAKE CITY, UTAH.
Hydrologic Reconnaissance of the Southern Uinta Basin, Utah and Colorado,
W75-10585 3B

Ground-Water Conditions in Utah, Spring of 1975,
W75-10606 2F

GEOLOGICAL SURVEY, TACOMA, WASH.
Flood Hazards in the Seattle-Tacoma Urban Complex and Adjacent Areas, Washington,
W75-10580 7C

Water Resources of the Toppenish Creek Basin, Yakima Indian Reservation, Washington.
W75-10603 3F

GEOLOGICAL SURVEY, TALLAHASSEE, FLA.
Hydrological Data From Wells in Southwest Hillsborough County, Florida, 1950-74,
W75-10593 7C

GEORGIA INST. OF TECH., ATLANTA. SCHOOL OF CIVIL ENGINEERING.
Statistical Tolerance Limits for a Pearson Type III Distribution,
W75-10511 2E

GEORGIA UNIV., ATHENS. COMPUTER CENTER.
Comments on the Statistical Distribution of Rainfall per Period Under Various Transformations,
W75-10517 2B

GEORGIA UNIV., SAVANNAH. AGRICULTURAL EXPERIMENT STATION.
Growth Factors in the Fish Meal Components of Catfish Diets,
W75-10658 2I

GORHAM INTERNATIONAL, INC., MAINE.
Study of Solid Waste Management Practices in the Pulp and Paper Industry.
W75-10366 5D

GREAT SOUTHERN PAPER CO., CEDAR SPRINGS, GA.
Analysis of Alternatives for Removal of Suspended Solids in Pulp and Paper Mill Effluents,
W75-10400 5D

GREINER (J.E.) CO., INC., TAMPA, FLA.
The Perimeter Canal - A New Approach to Discharge Urban Water into a Coastal Mangrove Area,
W75-10773 4A

GUELPH UNIV. (ONTARIO). DEPT. OF BOTANY AND GENETICS.
Measurement of Hydraulic Conductivity of Peats,
W75-10536 7B

GUELPH UNIV. (ONTARIO). DEPT. OF LAND RESOURCE SCIENCE.
Phosphorus in Percolates from Manured Lysimeters,
W75-10573 5B

GUELPH UNIV. (ONTARIO). DEPT. OF ZOOLOGY.
Temperature-Induced Changes in Acute Toxicity of Zinc to Atlantic Salmon (Salmo salar),
W75-10431 5C

HAWAII UNIV.-HILO COLL., HILO.
Water-Soil-Plant Interactions with Terbacil,
W75-10486 5C

HEBREW UNIV., REHOVOTH (ISRAEL). FACULTY OF AGRICULTURE.
Effects of Soil Moisture on Stress on 2 Varieties of Upland Cotton in Israel: IV. Effects of Periods of Stress Occurrence, Correlations and Regressions,
W75-10791 3F

HOWARD UNIV., WASHINGTON, D.C. BIO-ENVIRONMENTAL ENGINEERING AND SCIENCES RESEARCH LAB.
Population Dynamics of Protozoa in Wastewater, and Impact of Environmental Changes,
W75-10689 5D

HYDROCOMP, INC., PALO ALTO, CALIF.
Hourly Rainfall Generation for a Network,
W75-10515 2B

HYDROLOGIC ENGINEERING CENTER, DAVIS CALIF. PLANNING ANALYSIS BRANCH.
Optimal Sizing of Urban Flood-Control Systems,
W75-10821 4A

HYOGO PREFECTURE FISHERIES EXPERIMENT STATION, AKASHI (JAPAN).
Physiological Changes in the Serum and Hepatopancreas of Yellow Tail Injected with Carbon Tetrachloride, (In Japanese),
W75-10630 5C

HYOGO PREFECTURE FISHERIES EXPERIMENT STATION, KOBE (JAPAN).
Studies on the Metabolism of Chlorophenols in Fish-III Isolation and Identification of a Conjugated PCP Excreted by Goldfish,
W75-10611 5A

ILLINOIS STATE NATURAL HISTORY SURVEY, URBANA.
Uptake of Three Polychlorinated Biphenyls, DDT and DDE by the Green Sunfish, Lepomis Cyanellus Raf.,
W75-10422 5C

ILLINOIS STATE WATER SURVEY, URBANA.
A Two-Distribution Method for Fitting Mixed Distributions in Hydrology,
W75-10531 2E

ILLINOIS UNIV., URBANA. SCHOOL OF CHEMICAL SCIENCES.
Toxic Trace Elements: Preferential Concentration in Respirable Particles,
W75-10482 5A

INDIAN INST. OF TECH., BOMBAY. DEPT. OF CHEMISTRY.
Rapid Extractive Spectrophotometric Determination of Gold (III) With 4-(2-Pyridylazo)-Resorcinol,
W75-10499 2K

INSTITUT FRANCAIS DU PETROLE, PARIS.
Experience with the IFP Propane Clarification Process in Re-Refining Spent Crankcase Oils,
W75-10759 5D

INSTITUTE FOR SOIL RESEARCH, BELGRADE (YUGOSLAVIA).
Pedologic Cover of the Watershed of the Porecka River,
W75-10551 2A

INSTITUTE OF GEOLOGICAL SCIENCES, LONDON (ENGLAND). DEPT. OF HYDROGEOLOGY.
Hydraulic Behaviour of the Chalk Aquifer in the Yorkshire Wolds,
W75-10506 4B

INSTITUTE OF MARINE BIOCHEMISTRY, ABERDEEN (SCOTLAND).
The Effect of Heavy Metals on Photosynthesis and Loss of Cell Potassium in Two Species of Marine Algae, Dunaliella tertiolecta and Phaeodactylum tricornutum,
W75-10447 5C

The Effect of Some Heavy Metal Ions on Photosynthesis in a Freshwater Alga,
W75-10627 5C

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Toxicity of Pulping Wastes to Fish,
W75-10403 5C

INSTITUTT FOR ATOMENERGI, KJELLER (NORWAY). ISOTOPE LABS.
Determination of Nickel in Rocks After Epithermal Neutron Activation,
W75-10493 2K

IOWA STATE UNIV., AMES. DEPT. OF CIVIL ENGINEERING.
Statistical Model of Short-Duration Precipitation Events,
W75-10529 2B

IOWA STATE UNIV., AMES. DEPT. OF ECONOMICS.
Developing Regional Stochastic Data Bases,
W75-10528 2E

IOWA STATE UNIV., AMES. ENGINEERING RESEARCH INST.
Five Year Study of Des Moines River Water Quality,
W75-10803 5B

IOWA UNIV., IOWA CITY. DEPT. OF CIVIL (ENVIRONMENTAL) ENGINEERING.
Analysis of Wastewater Treatment Systems for a Meat Processing Plant,
W75-10687 5D

IOWA UNIV., IOWA CITY. INST. OF HYDRAULIC RESEARCH.
Hydraulics and Mechanics of River Ice Jams,
W75-10556 8B

JET PROPULSION LAB., PASADENA, CALIF.
Application of Low-Latitude Microbial Ecology to High-Latitude Deserts,
W75-10459 2C

KAISER ENGINEERS, OAKLAND, CALIF.
Nuclear Power Plant Cooling System Selection,
W75-10822 6C

KANAGAWA UNIV. (JAPAN). BIOLOGY INST.
The Effect of the Quantity of Silt to the Attached Microorganisms of the Kuzuryu-Gawa River in the Hokuriku District, (In Japanese),
W75010696 5C

KANSAS STATE SENATE, TOPEKA. 39TH DISTRICT.
Users' View of Weather Modification,
W75-10776 3B

KANSAS UNIV., LAWRENCE.
Waste Water Treatment: Lagoons and Oxidation Ponds,
W75-10374 5D

KENT STATE UNIV., OHIO. DEPT. OF BIOLOGICAL SCIENCE.
Acute Toxicity of Ammonia to Several Developmental, Stages of Rainbow Trout, Salmo Gairdneri,
W75-10619 5C

KENTUCKY WATER RESOURCES INST., LEXINGTON.
Derivation of Reservoir Operating Rules by Economic Analysis,
W75-10825 4A

Analysis of Reservoir Recreation Benefits,
W75-10826 6B

The Effect of Landowner Attitude on the Financial and the Economic Costs of Acquiring Land for a Large Public Works Project,
W75-10827 6B

Review of the Economic Benefits and Costs Resulting from Dewey Reservoir,
W75-10828 6B

KEYSTONE JUNIOR COLL., LAPLUME, PA. DEPT. OF MATHEMATICS.
Recurrence Intervals of Annual Minimum Streamflows,
W75-10530 2E

KINNERET LIMNOLOGICAL LAB., TIMBERIAS (ISRAEL).
Urea in the Waters of Lake Kinneret (Sea of Galilee),
W75-10420 5C

KURITA WATER INDUSTRIES LTD., OSAKA (JAPAN). (ASSIGNEE)
Method of Treating Aluminum-Containing Waste Water,
W75-10730 5D

KYOTO UNIV. (JAPAN).
Determination of Manganese in Natural Waters by Atomic Absortion Spectrometry with a Carbon Tube Atomizer,
W75-10386 5A

KYUSHU UNIV., FUKUOKA (JAPAN).
Color of Pulp Industry Waste Liquors. (6). Behavior of Color During Waste Treatments (In Japanese),
W75-10393 5D

Color of Pulp Industry Waste Liquors. (7). Color Reduction by Ultraviolet Treatment (In Japanese),
W75-10394 5D

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W75-10418 5C

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W75-10417 5C

LAMONT-DOHERTY GEOLOGICAL OBSERVATORY, PALISADES, N.Y.
Floating Glacial Ice Caps in the Arctic Ocean,
W75-10533 2C

LANDESANSTALT FUER GEWASSERKUNDE UND GEWASSERSCHUTZ NORDRHEIN-WESTFALEN, KREFELD (WEST GERMANY).
X-ray Microanalysis of Zinc and Iron in the Cheloride Cells of Mayfly Larvae of the River Sulz, (Rontgenmikroanalyse von Zink und Eisen in Chloridzellen von Eintagsfligenlarven aus der Sulz),
W75-10416 5A

LIVERPOOL UNIV. (ENGLAND). DEPT. OF OCEANOGRAPHY.
Average Trace Element Composition of Low Level Marine Atmospheric Particulates,
W75-10477 5B

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The Effects of Crude Oil on the Palatability of Marine Crustaceans,
W75-10428 5C

LOZIER ENGINEERS, INC., ROCHESTER, N.Y.
Treatment of Winery Wastes by Aerated Lagoon, Activated Sludge, and Rotating Biological Contractor,
W75-10685 5D

MACAULAY INST. FOR SOIL RESEARCH, ABERDEEN (SCOTLAND).
The Determination of Mercury in Soils and Related Materials by Cold-Vapour Atomic Absorption Spectrometry,
W75-10485 5A

MARITIME ADMINISTRATION, WASHINGTON, D.C.
Port Reception and Treatment Facilities for Oily Waste from Vessels,
W75-10751 5G

MARYLAND ENVIRONMENTAL SERVICE, ANNAPOLIS.
Waste Oil in Maryland: A Pollutant or a Resource,
W75-10744 5B

Waste Oil--Solution to Maryland's Energy Crisis,
W75-10762 5D

MARYLAND PORT AUTHORITY, BALTIMORE.
A Program for Handling Emergency Oil Spillages in the Port of Baltimore,
W75-10755 5G

MARYLAND UNIV., SOLOMONS. CHESAPEAKE BIOLOGICAL LAB.
Daily Temperature and Salinity of Surface Water of Patuxent River at Solomons, Maryland, Based on 30 Years of Records (1938-1967),
W75-10535 2E

MASSACHUSETTS UNIV., GLOUCESTER. MARINE STATION.
Decrease of Net Carbon Flux in Two Species of Mussels Caused by Extracts of Crude Oil,
W75-10433 5C

MASSACHUSETTS WATER RESOURCES COMMISSION, BOSTON. DIV. OF WATER POLLUTION CONTROL.
Massachusetts Waste Oil Management Activities,
W75-10763 5D

MATERIALS RESEARCH LABS., MELBOURNE (AUSTRALIA).
Trace Elements in Melbourne Rivers - An Interlaboratory Analysis,
W75-10649 5A

MEIJI SEIKI KAISHA LTD., YOKOHAMA (JAPAN). RESEARCH LABS.
Residue Analyses on 2-Amino-4 Phenylthiazole, a Piscine Anesthetic, in Fishes-I a Model Radio-Tracer Experiment with Medaka,
W75-10614 5A

MELBOURNE UNIV., PARKVILLE (AUSTRALIA). (ASSIGNEE)
Removal of Pollutants from Water,
W75-10736 5D

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Copper, Zinc and Total Protein Levels in the Plasma of Sockeye Salmon (Oncorhynchus Nerka) During Their Spawning Migration,
W75-10613 5C

MICHIGAN DEPT. OF NATURAL RESOURCES, LANSING. BUREAU OF WATER MANAGEMENT.
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W75-10680 5C

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Toxicity of the Lampricide 3-Trifluoromethyl-4-nitrophenol (TFM) to 10 Species of Algae,
W75-10697 5C

MICHIGAN UNIV., ANN ARBOR.
The Effect of Certain Organic Pollutants on Copper Toxicity to Fish (Lebistes Reticulatus),
W75-10637 5C

MILLAQUIN SUGAR MILL, QUEENSLAND (AUSTRALIA).
Heat Treatment of Sewage Sludges,
W75-10644 5D

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Inhibition of ATPases Acitivity in Channel Catfish Brain by Kepone(Trade Name) and its Reduction Product,
W75-10612 5C

MISSOURI DEPARTMENT OF CONSERVATION, JEFFERSON CITY.
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W75-10451 5C

MISSOURI UNIV., COLUMBIA. DEPT. OF CIVIL ENGINEERING.
Deterioration of Water Quality in Distribution Systems,
W75-10711 5F

MODESTO IRRIGATION DISTRICT, CALIF.
Automation of an Existing Irrigation System - Part I,
W75-10788 8C

MONTANA UNIV., MISSOULA. DEPT. OF BOTANY.
Effect of the Insecticide Zectran (Mexacarbate) on Several Algae,
W75-10425 5C

MONTANA UNIV., MISSOULA. DEPT. OF ZOOLOGY.
An Investigation of the Ecology and Water Quality of a Lake Outlet,
W75-10724 5C

MONTREAL URBAN COMMUNITY (QUEBEC). WATER PURIFICATION DEPT.
Determine Urban Runoff the Simple Way,
W75-10716 2E

N-CON SYSTEMS CO., INC., LARCHMONT, N.Y.
Automated Sequential Composite Sampling. A New Technique for Water Pollution Study and Control,
W75-10690 5A

NAGOYA UNIV. (JAPAN). DEPT. OF SYNTHETIC CHEMISTRY.
Spectroscopic Determination of Atomization Efficiency (CuCl-Cu+Cl) in an Air-Hydrogen Flame,
W75-10498 2K

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, WALLOPS ISLAND, VA. WALLOPS STATION.
Error Analysis of Dobson Spectrophotometer Measurements of the Total Atmospheric Ozone Content,
W75-10545 7B

NATIONAL COUNCIL OF THE PAPER INDUSTRY FOR AIR AND STREAM IMPROVEMENT, INC., NEW YORK.
Industrial Wastes: Paper and Allied Products,
W75-10397 5D

NATIONAL ENVIRONMENTAL RESEARCH CENTER, CINCINNATI, OHIO. ADVANCED WASTE TREATMENT RESEARCH LAB.
Waste Water Treatment: Water Reclamation and Reuse,
W75-10372 5D

Problems Encountered in Sludge Treatment and Some Advanced Solutions,
W75-10398 5E

Plant Performance Using Dissolved Oxygen Control,
W75-10452 5D

Coping With Urban Runoff in the United States,
W75-10541 5D

NATIONAL ENVIRONMENTAL RESEARCH CENTER, CINCINNATI, OHIO. WATER SUPPLY RESEARCH LAB.
Treatment Processes for Coping with Variation in Raw-Water Quality,
W75-10705 5F

NATIONAL INST. OF OCEANOGRAPHY, WORMLEY (ENGLAND).
On the Joint Distribution of the Periods and Amplitudes of Sea Waves,
W75-10534 2L

NATIONAL LIME ASSOCIATION, WASHINGTON, D.C.
Water Pollution Problems Associated with Control of Stack Gas Emission,
W75-10691 5B

NATIONAL MARINE FISHERIES SERVICE, ST. PETERSBURG, FLA. SOUTHEAST REGION.
Additional Studies of the Fishes, Macroinvertebrates and Hydrological Conditions of Upland Canals in Tampa Bay, Florida,
W75-10617 5C

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, ROCKVILLE, MD.
International Field Year for the Great Lakes.
W75-10547 2H

International Field Year for the Great Lakes.
W75-10548 2H

International Field Year for the Great Lakes.
W75-10549 2H

International Field Year for the Great Lakes.
W75-10550 2H

NATIONAL SCIENCE FOUNDATION, WASHINGTON, D.C. OFFICE FOR THE INTERNATIONAL DECADE OF OCEAN EXPLORATION.
International Exploration Locates Minerals and Oils,
W75-10467 5B

NATIONAL TAIWAN UNIV., TAIPEI. INST. OF OCEANOGRAPHY.
Heavy Metal Contents of Fishes Caught in Kaohsiung Harbor, (In Chinese),
W75-10430 5A

NATIONAL WATER QUALITY LAB., DULUTH, MINN.
Multichannel Toxicant Injection System for Flow-Through Bioassays,
W75-10443 5A

NATURE CONSERVANCY, ABBOTS RIPTON (ENGLAND). MONKS WOOD EXPERIMENTAL STATION.
Herbicides in Aquatic Systems,
W75-10625 5C

NAVAL MATERIAL COMMAND, WASHINGTON, D.C.
The Navy's Oily Wastes Handling and Disposal Program,
W75-10750 5D

NEPTUNE MICROFLOC, INC., CORVALLIS, OREG.
Water-Quality Requirements for the Petroleum Industry,
W75-10465 5D

NETHERLANDS WATERWORKS, RIJSWIJK. TESTING AND RESEARCH INST.
Domestic Waste Water Reuse--Aspects of the Treatment System,
W75-10708 5D

NEVADA UNIV., RENO.
A Method of Disaggregation,
W75-10817 6A

NEVADA UNIV., RENO. DESERT RESEARCH INST.
Multisite Streamflow Simulation of Truckee River, Nevada,
W75-10509 2E

NEW HAMPSHIRE UNIV., DURHAM. DEPT. OF CHEMISTRY.
Organic Matter in Natural Water and Water Treatment,
W75-10351 5B

NEW MEXICO STATE ENGINEER, SANTA FE.
Economic Impact of the Conversion of Water from Irrigation to Municipal and Industrial Use in the Rio Grande Basin of New Mexico,
W75-10771 6D

NEW MEXICO STATE UNIV., UNIVERSITY PARK. DEPT. OF AGRICULTURAL ENGINEERING.
Water Use and Production of Trickle Irrigated Onions,
W75-10785 3F

NEW YORK STATE DEPT. OF ENVIRONMENTAL CONSERVATION, ALBANY.
Waste Water Treatment: Land Disposal of Waste Water,
W75-10373 5E

Toxicity of Two Synthetic Pyrethrins to Brown Trout,
W75-10438 5C

NEW YORK STATE DEPT. OF ENVIRONMENTAL CONSERVATION, ALBANY. DIV. OF PURE WATERS.
Guidelines for Landfill of Toxic Industrial Sludges,
W75-10487 5G

NORTH CAROLINA STATE UNIV., RALEIGH.
Relationships Between Drouth and Corn Yields on Selected South Atlantic Coastal Plain Soils,
W75-10721 3F

NORTH CAROLINA STATE UNIV., RALEIGH. DEPT. OF BIOLOGICAL AND AGRICULTURAL ENGINEERING.
A Precipitation Data Simulator Using a Second Order Autoregressive Scheme,
W75-10513 2B

NORTH CAROLINA STATE UNIV., RALEIGH. DEPT. OF SOIL SCIENCE.
Phosphorus Availability of Some Philippine Rice Soils as Affected by Soil and Water Management Practices,
W75-10421 3F

NUOVO PIGNONE S.P.A., SAN DONATO MILANESE (ITALY). (ASSIGNEE)
Liquefying Refrigerant for Water Desalination with Liquefied Natural Gas and an Intermediate Energy Cycle,
W75-10725 3A

OAK RIDGE NATIONAL LAB., TENN.
Flooding and Soil Temperature Effects on Wheat During Grain Filling,
W75-10829 3F

OCEANIC INST., WAIMANALO, HAWAII.
Critical Thermal Maxima of Three Species of Hawaiian Estuarine Fish: A Comparative Study,
W75-10426 5C

OHIO AGRIC. RES. DEV. CENT., WOOSTER,LAB. ENVIRONMENT. STUDIES.
Importance of Plants in Oxygen Production, Carbon Dioxide Consumption and Air Purification,
W75-10715 2I

OHIO STATE UNIV., COLUMBUS. DEPT. OF AGRICULTURAL ENGINEERING.
Sludge Disposal on Agricultural Soil,
W75-10674 5D

OKLAHOMA UNIV., NORMAN. SCHOOL OF CIVIL ENGINEERING AND ENVIRONMENTAL SCIENCE.
Water Reuse in a Paper Reprocessing Plant,
W75-10401 5D

ONTARIO MINISTRY OF NATURAL RESOURCES, SAULT STE. MARIE (ONTARIO). FISH AND WILDLIFE RESEARCH BRANCH.
Effects of Temperature on Development and Survival of Rainbow Trout, Salmo Gairdneri, in Acid Waters,
W75-10623 5C

ORANGE COUNTY POLLUTION CONTROL DEPT., ORLANDO, FLA.
Effects of Farming - Urban Drainage on Fresh Water,
W75-10802 5G

OREGON STATE UNIV., CORVALLIS.
A Theory of the Mass Transport of Previously Distributed Chemicals in a Water-Saturated Sorbing Porous Medium: 4. Distributions,
W75-10632 5B

OREGON STATE UNIV., NEWPORT. DEPT. OF FISHERIES AND WILDLIFE.
Effects of the Insecticide Sevin and Its First Hydrolytic Product, 1-Napthol, on Some Early Developmental Stages of the Bay Mussel, Mytilus edulis,
W75-10435 5C

ORLANDO UTILITIES COMMISSION, FLA.
Analysis of a Large Water Distribution System Using Advanced Computer Software,
W75-10720 4A

OSLO UNIV. (NORWAY). DEPT. OF CHEMISTRY.
Atomic-Absorption Spectrometric Determination of Copper, Lead, Cadmium and Manganese in Pulp and Paper by the Direct-Atomization Technique,
W75-10489 5A

Atomic Absorption Spectrometric Determination of Cadmium, Lead, Silver, Thallium and Zinc in Silicate Rocks by Direct Atomization From the Solid State,
W75-10492 2K

OTTAWA-CARLETON REGIONAL MUNICIPALITY, OTTAWA (ONTARIO).
The Master Plan for Water-Supply in the Regional Municipality of Ottawa-Carleton,
W75-10710 3D

OTTAWA UNIV. (ONTARIO). DEPT. OF PHARMACOLOGY.
Persistence of Cadmium-Induced Metabolic Changes in Liver and Kidney,
W75-10478 5A

PERMUTIT RESEARCH AND DEVELOPMENT CENTER, PRINCETON, N.J.
Gravity Dewatering of Metal Hydroxide Sludges,
W75-10500 5D

PERMUTIT RESEARCH CENTER, PRINCETON, N.J.
Concentration of Dilute Waste Streams by Ion Exchange Techniques,
W75-10672 5D

PITTSBURGH UNIV., PA. GRADUATE SCHOOL OF PUBLIC HEALTH.
Some Observations on Spawning of Brook Trout (Salvelinus Fontinalis Mitchill) in Lime Neutralized Iron Hydroxide Suspensions,
W75-10445 5C

PORT AUTHORITY OF NEW YORK AND NEW JERSEY.
Environmental Action at Port Authority Airports,
W75-10748 5G

PRINCETON UNIV., N.J. DEPT. OF PHILOSOPHY.
Report to the Technical Committee of the Water Resources Centers of the Thirteen Western States,
W75-10809 6B

PURDUE UNIV., LAFAYETTE, IND. AGRICULTURAL EXPERIMENT STATION.
Operational Value of Weather Information in Relation to Soil Management Characteristics,
W75-10367 2G

PURDUE UNIV., LAFAYETTE, IND. SCHOOL OF CIVIL ENGINEERING.
Removal of Periodicities by Differencing and Monthyl Mean Subtraction,
W75-10352 2A

Environmental Problems Associated with the Use of Cooling Towers,
W75-10671 5D

RENSSELAER POLYTECHNIC INST., TROY, N.Y. BIO-ENVIRONMENTAL ENGINEERING DIV.
Treatment of Milk Truck Washing Wastes by Anerobic Digestion,
W75-10673 5D

RHODE ISLAND UNIV., KINGSTON. GRADUATE SCHOOL OF OCEANOGRAPHY.
Arsenate Uptake and Reduction by Pocillopora verrucosa,
W75-10491 5C

RICE UNIV., HOUSTON, TEX. DEPT. OF BIOLOGY.
Biological Bases for Water Quality Standards,
W75-10677 5G

RUSSELL AND AXON, INC., DAYTONA BEACH, FLA.
Heavy Metals Removal from Wood Preserving Wastewater,
W75-10675 5D

RUTGERS - THE STATE UNIV., NEW BRUNSWICK, N.J.
Soils of the High Arctic Landscapes,
W75-10458 2C

SAN ANTONIO MUNICIPAL WASTEWATER TREATMENT PLANT, TEX.
Rate of Phosphorus Uptake by Activated Sludge,
W75-10839 5D

SINGER CO., BRIDGEPORT, CONN. WATER RESOURCES DIV.
Water and Wastewater Facilities for Florida Housing Developments,
W75-10717 5D

SOIL CONSERVATION SERVICE, WASHINGTON, D.C.
Environmental Issues, Effects, and Solutions,
W75-10795 6G

SOUTH CAROLINA UNIV., COLUMBIA. DEPT. OF BIOLOGY.
The Effect of Temperature and Salinity on Cadmium Uptake by the Blue Crab, Callinectes sapidus,
W75-10448 5C

SOUTH DAKOTA SCHOOL OF MINES AND TECHNOLOGY, RAPID CITY. INST. OF ATMOSPHERIC SCIENCES.
Weather Modification for Use in the High Plains,
W75-10775 3B

STATE UNIV. OF NEW YORK, BUFFALO. DEPT. OF CIVIL ENGINEERING.
Physical Model Study of Circulation Patterns in Lake Ontario,
W75-10537 2H

STATE UNIV. OF NEW YORK, STONY BROOK.
Effects of Chlorinated Hydrocarbon Pollutants on Growth of Marine Phytoplankton in Culture,
W75-10636 5C

STATE UNIV. OF NEW YORK, SYRACUSE. COLL. OF ENVIRONMENTAL SCIENCE AND FORESTRY.
A Note on Mixed Distributions in Hydrology,
W75-10527 2E

STOCKHOLM MUNICIPAL SERVICES DEPT. (SWEDEN). DIV. OF TREATMENT PLANT DESIGN.
Stockholm Puts Sewage Plants Underground,
W75-10718 5D

STUDLEY SHUPERT AND CO., INC., BOSTON, MASS.
Financing Water Works,
W75-10712 3D

SUN OIL CO., PHILADELPHIA, PA.
The Source and Supply of Virgin Lubes,
W75-10741 5B

SUPERIOR FARMING CO., BAKERSFIELD, CALIF.
Development of Large Scale Drip Irrigation Systems,
W75-10784 3F

SWEDISH WATER AND AIR POLLUTION RESEARCH LAB., GOTEBORG.
Toxic Effects of Aliphatic Chlorinated by-Products from Vinyl Chloride Production on Marine Animals,
W75-10412 5C

SYRACUSE UNIV., N.Y. DEPT. OF CIVIL ENGINEERING.
Lagoons Plus Spray Irrigation for Effective Bean Cannery Waste Treatment,
W75-10678 5D

TABRIZ UNIV. (IRAN). ANALYTICAL LAB.
Fast Separation of Tin (IV) From Tin (II) and From Numerous Metal Ions on Ion-Exchange Papers,
W75-10497 2K

TECHNICAL UNIV., LODZ (POLAND). INST. OF CHEMICAL FOOD TECHNOLOGIES.
Automatic Device for the Operational Control of the Filtration Rate of Suspensions(Automatische Vorrichtung zur Technischen Kontrolle der Filtrationsgeschwindigkeit von Suspensionen),
W75-10830 5D

TECHNISCHE UNIVERSITAET, DRESDEN (EAST GERMANY).
Studies on Possibilities of Biochemical Purification of Evaporator Condensate Occurring During Sulfite Pulp Manufacture (Untersuchungen ueber die Moeglichkeit der biochemischen Reinigung des bei der Sulfitzellstoffherstellung anfallenden Eindampfkondensates),
W75-10382 5D

TEXAS A AND M UNIV., COLLEGE STATION. BIOENGINEERING PROGRAM.
An Analysis of the Mechanics of Guard Cell Motion,
W75-10488 2I

TEXAS A AND M UNIV., COLLEGE STATION. ENVIRONMENTAL ENGINEERING DIV.
Effects of an Offshore Crude Oil Unloading Terminal on the Marine Environment,
W75-10642 5C

TEXAS OFFICE OF THE GOVERNOR, AUSTIN. WATER TASK FORCE.
Impacts of Rural to Urban Water Use,
W75-10772 6D

TEXAS UNIV. AT AUSTIN. DEPT. OF GEOLOGICAL SCIENCES.
Competence of Rivers to Transport Coarse Bedload Material,
W75-10540 2J

TEXAS UNIV., PORT ARANSAS. INST. OF MARINE SCIENCE.
The Effects of a No. 2 Fuel Oil and Two Crude Oils on the Growth and Photosynthesis of Microalgae,
W75-10436 5C

TOKAI REGIONAL FISHERIES RESEARCH LAB., TOKYO (JAPAN).
PCBS in the Spotted Sharks, Mustelus Manazo, From Tokyo Bay, (In Japanese),
W75-10622 5A

TOKYO UNIV. (JAPAN). DEPT. OF PUBLIC HEALTH.
Electron Microscope Autoradiography of Kidney After Administration of PB-210 in Mice,
W75-10476 5A

TORONTO UNIV. (ONTARIO). DEPT. OF MECHANICAL ENGINEERING.
Fluid-Dynamic Excitation Involving Flow Instability,
W75-10544 8B

TORONTO UNIV. (ONTARIO). DEPT. OF MECHANICAL ENGINEERING; AND TORONTO UNIV. (ONTARIO). INST. OF ENVIRONMENTAL SCIENCES AND ENGINEERING.
Some Problems in Pure and Applied Stochastic Hydrology,
W75-10508 2A

TRW SYSTEMS GROUP, REDONDO BEACH, CALIF. ENGINEERING SCIENCES LAB.
Laboratory Measurement of Surface Temperature Fluctuations Induced by Small Amplitude Surface Waves,
W75-10505 2L

TULSA UNIV., OKLA.
Pipeline Stress Analysis,
W75-10824 8B

UKRAINSKII NAUCHNO-ISSLEDOVATELSKII INSTITUT BUMAGI, KIEV (USSR).
Increasing the Efficiency of Flotation Savealls (Povyshenie effektivnosti raboty flotatsionnykh lovushek),
W75-10369 5D

UNILEVER LTD., SHARNBROOK (ENGLAND). UNILEVER RESEARCH LAB.
Effect of Water Hardness on the Toxicity of a Nonionic Detergent to Fish,
W75-10444 5C

Absorption, Metabolism, and Excretion by Goldfish of the Anionic Detergent Sodium Lauryl Sulphate,
W75-10626 5C

UNION CARBIDE CORP., NEW YORK. (ASSIGNEE)
Integral Circular Wastewater Treatment Plant,
W75-10729 5D

UNION CARBIDE CORP., TUXEDO, N.Y.
How to Purify Effluents, Recover Byproducts With Reverse Osmosis,
W75-10391 5F

UNIVERSITY COLL., LONDON (ENGLAND). DEPT. OF GEOGRAPHY.
The Effects of Urbanization on Floods of Different Recurrence Interval,
W75-10709 4C

UNIVERSITY COLL., LONDON (ENGLAND). DEPT. OF POLITICAL ECONOMY.
Pollution Control and Optimal Taxation: A Static Analysis,
W75-10359 6E

UNIVERSITY OF NEW ENGLAND, ARMIDALE (AUSTRALIA). DEPT. OF GEOGRAPHY.
Flood Waves and Suspended Sediment Pulses in Urbanized Catchments,
W75-10647 4C

UNIVERSITY OF NEW SOUTH WALES, KENSINGTON (AUSTRALIA). FACULTY OF MILITARY STUDIES.
Valley Design in Urban Growth Centres,
W75-10643 6B

UNIVERSITY OF SOUTHERN CALIFORNIA, LOS ANGELES. DEPT. OF BIOLOGICAL SCIENCES.
DDT : Short Term Effects on Osmoregulation in Black Surfperch (Embiotoca Jacksoni),
W75-10429 5C

UPPSALA UNIV. (SWEDEN). INST. OF BIOCHEMISTRY.
Cellulose Degradation in Waste Water Treatment,
W75-10376 5D

USTAV HYGIENY, PRAGUE (CZECHOSLOVAKIA).
Sensitivity of Human Diploid Embryonic Lung Cells from Isolation of Echo Viruses from Sewage,
W75-10836 5C

UTAH STATE UNIV., LOGAN.
A Connectives Model Relating Water Policy Action Variables to Recreational Opportunity Social Indicators,
W75-10819 6A

Algorithmic Modeling and the Straw Man,
W75-10820 6A

UTAH STATE UNIV., LOGAN. DEPT. OF AGRICULTURAL AND IRRIGATION ENGINEERING.
Effect of Agricultural Use on Water Quality for Downstream Use for Irrigation,
W75-10805 5G

VICTORIA STATE RIVERS AND WATER SUPPLY COMMISSION, MELBOURNE (AUSTRALIA).
The Mutual Destruction of Polluting Factors in Waste Liquors,
W75-10645 5D

VIENNA UNIV., (AUSTRIA).
Determination of Cadmium, Copper, and Lead in Natural Waters After Anion-Exchange Separation,
W75-10385 5A

VIRGINIA INST. OF MARINE SCIENCE, GLOUCESTER POINT.
Wave Climate Model of the Mid-Atlantic Shelf and Shoreline (Virginian Sea), Model Development, Shelf Geomorphology, and Preliminary Results,
W75-10552 2L

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG.
Response of Freshwater Protozoan Artificial Communities to Metals,
W75-10440 5C

Will Wastewater Treatment Stop Eutrophication of Impoundments,
W75-10686 5D

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. DEPT. OF BIOLOGY.
Enrichment of Surface Freshwater Microlayers with Algae,
W75-10583 5A

The Effect of Sublethal Concentrations of Copper and Zinc on Ventilatory Activity, Blood Oxygen, and pH in Rainbow Trout (Salmo Gairdneri),
W75-10624 5C

VITERBO COLL., LA CROSSE, WIS. DEPT. OF BIOLOGY.
Uptake, Elimination and Biotransformation of the Lampricide 3-Trifluromethyl-4-Nitrophenol (TFM) by Larvae of the Aquatic Midge Chironomus Tentans,
W75-10629 5C

VITERBO COLL., LACROSSE, WIS. DEPT. OF BIOLOGY.
Acute Toxicities of 3-Trifluoromethyl-4-Nitrophenol (TFM) and 2',5-Dichloro-4'-Nitrosalicylanilide (Bayer 73) to Larvae of the Midge (Chironomus Tentans),
W75-10698 5C

VSESOYUZNYI NAUCHNO-ISSLEDOVATELSKII INSTITUT VODOSNABZHENIYA, KANALIZATSII, GIDROTEKHNICHESKIKH SOORUZHENII I INZHENERNOI, GIDROGEOLOGII, MOSCOW (USSR).
Instruction for Record Keeping of Water Consumption at the Enterprises of the Paper Industry (Instruktsiya ucheta raskhoda vody na predpriyatiyakh otrasli),
W75-10370 3E

WAPORA, INC., WASHINGTON, D.C.
Fishes of the Hiwassee River System: Ecological and Taxonomic Considerations,
W75-10694 5C

WASHINGTON UNIV., SEATTLE.
Egalitarianism,
W75-10818 6A

WASHINGTON UNIV., SEATTLE. COLL. OF FOREST RESOURCES.
Organic Compounds in Pulp Mill Lagoon Discharge,
W75-10402 5D

WASHINGTON UNIV., SEATTLE. DEPT. OF CIVIL ENGINEERING.
Use of Autoregressive Runoff Models in Reservoir Studies,
W75-10523 2E

Disposal of Digested Sewage Sludge by Landfill,
W75-10682 5D

WASHINGTON UNIV., SEATTLE. DEPT. OF OCEANOGRAPHY.
Toward an Ice-Free Arctic Ocean,
W75-10532 2C

WATER POLLUTION RESEARCH LAB., STEVENAGE (ENGLAND).
The Consequences of Accepting Industrial Wastes into Sewers; Water Pollution Research at Stevenage,
W75-10842 5D

The Toxicity of Heavy Metal Ions to Anaerobic Digestion,
W75-10843 5D

WATER RESOURCES ENGINEERS, INC., WALNUT CREEK, CALIF.
Evaluation of Agricultural Drainage in Water Quality Management,
W75-10796 5G

WATERLOO UNIV. (ONTARIO). DEPT. OF CIVIL (ENGINEERING.
A Criterion for Vegetation Stiffness,
W75-10782 4A

WELLTON-MOHAWK IRRIGATION AND DRAINAGE DISTRICT, ARIZ.
Wellton-Mohawk Drainage and the Mexican Salt Problem,
W75-10783 4A

WILLIAMS COLL., WILLIAMSTOWN, MASS. DEPT. OF ECONOMICS.
Derived Decision Rules for Pollution Control in a General Equilibrium Space Economy,
W75-10360 6C

WINONA STATE COLL., MINN.
Acute Toxicity of the Lampricide 3-Trifluoromethyl-4-Nitro-Phenol (TFM) to Nymphs of Mayflies (Hexagenia Sp.),
W75-10699 5C

WISCONSIN TISSUE MILLS, NEENAH, WIS.
Wisconsin Tissue Mills One Year After Startup of the Effluent Plant,
W75-10378 5D

WISCONSIN UNIV., MADISON.
Redistribution and Concentration of Mercury in the Environment,
W75-10483 5B

WISCONSIN UNIV., MADISON. DEPT. OF BACTERIOLOGY.
Environmental Limitations on the Microbial Degradation of Hydrocarbons in Temperate Lakes,
W75-10407 5C

Production of Microbial Protein From Waste Cellulose by Thermomonospora Fusca, A Thermophilic Actinomycete,
W75-10538 5C

WISCONSIN UNIV., MADISON. DEPT. OF CIVIL AND ENVIRONMENTAL ENGINEERING.
Treatability of Leachate from Sanitary Landfills,
W75-10683 5D

WORCESTER POLYTECHNIC INST., MASS.
An Evaluation of Persistency for Water Borne Organics,
W75-10850 5B

WRIGHT WATER ENGINEERS, INC., DENVER, COLO.
Art of Agricultural Drainage Design and Costs,
W75-10797 4A

WYOMING UNIV., LARAMIE. DIV. OF AGRICULTURAL ECONOMICS.
Analyzing Reimbursement Mechanisms for Resource Development Projects,
W75-10353 6C

ZENKOKU REITOGYONIKU KYOKAI, HOKKAIDO (JAPAN). (ASSIGNEE)
Method of Purification of Waste Water Produced From the Packing of Meat and Aquatic Animals,
W75-10737 5D

ACCESSION NUMBER INDEX

W75-10351 5B
W75-10352 2A
W75-10353 6C
W75-10354 6B
W75-10355 6B
W75-10356 5G
W75-10357 5G
W75-10358 6B
W75-10359 6E
W75-10360 6C
W75-10361 6C
W75-10362 8I
W75-10363 8A
W75-10364 8G
W75-10365 5D
W75-10366 5D
W75-10367 2G
W75-10368 5D
W75-10369 5D
W75-10370 3E
W75-10371 5D
W75-10372 5D
W75-10373 5E
W75-10374 5D
W75-10375 2I
W75-10376 5D
W75-10377 5C
W75-10378 5D
W75-10379 5D
W75-10380 5D
W75-10381 5D
W75-10382 5D
W75-10383 5F
W75-10384 5G
W75-10385 5A
W75-10386 5A
W75-10387 5C
W75-10388 5C
W75-10389 5D
W75-10390 5D
W75-10391 5F
W75-10392 5A
W75-10393 5D
W75-10394 5D
W75-10395 5D
W75-10396 5D
W75-10397 5D
W75-10398 5E
W75-10399 5D
W75-10400 5D
W75-10401 5D
W75-10402 5D
W75-10403 5C
W75-10404 3B
W75-10405 3B
W75-10406 3B
W75-10407 5C
W75-10408 5A
W75-10409 5C
W75-10410 5C
W75-10411 5C
W75-10412 5C
W75-10413 5C
W75-10414 5B
W75-10415 5C
W75-10416 5A
W75-10417 5C
W75-10418 5C
W75-10419 5A
W75-10420 5C
W75-10421 3F
W75-10422 5C
W75-10423 5C
W75-10424 5C
W75-10425 5C
W75-10426 5C
W75-10427 5C
W75-10428 5C
W75-10429 5C
W75-10430 5A
W75-10431 5C
W75-10432 5A
W75-10433 5C
W75-10434 5C
W75-10435 5C
W75-10436 5C
W75-10437 5C
W75-10438 5C
W75-10439 5C
W75-10440 5C
W75-10441 5C
W75-10442 5A
W75-10443 5A
W75-10444 5C
W75-10445 5C
W75-10446 5B
W75-10447 5C
W75-10448 5C
W75-10449 5C
W75-10450 5C
W75-10451 5C
W75-10452 5D
W75-10453 10C
W75-10454 2C
W75-10455 2C
W75-10456 2C
W75-10457 2C
W75-10458 2C
W75-10459 2C
W75-10460 6D
W75-10461 2C
W75-10462 2C
W75-10463 2C
W75-10464 5B
W75-10465 5D
W75-10466 5G
W75-10467 5B
W75-10468 5G
W75-10469 5G
W75-10470 5G
W75-10471 5G
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W75-10841	2K
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W75-10843	5D
W75-10844	5A
W75-10845	8C
W75-10846	5B
W75-10847	2J
W75-10848	2J
W75-10849	5C
W75-10850	5B
W75010696	5C

ABSTRACT SOURCES

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Franklin Institute (FIRL), Municipal and Industrial Wastewater Treatment Technology	W75-10364 10464--10475 10607--10608 10633--10642 10739--10768 10830--10843	69
Illinois State Water Survey, Hydrology	W75-10502--10535 10537 10539--10541 10543--10556 10558, 10632 10769--10790 10793--10805	89
Institute of Paper Chemistry, Water Pollution from Pulp and Paper Industry	W75-10365--10366 10368--10374 10376--10406	40
University of Arizona, Arid Land Water Resources	W75-10453--10463	11
University of Florida, Eastern U. S. Water Law	W75-10363	1
University of North Carolina, Metropolitan Water Resources Planning and Management	W75-10559--10572 10574--10579 10705--10713 10716--10720 10722--10723	36
University of Wisconsin, Eutrophication	W75-10351	1
University of Wisconsin, Water Resources Economics	W75-10353--10361	9
B. STATE WATER RESOURCES RESEARCH INSTITUTES	W75-10352, 10407 10724 10825--10828 10849--10850	9

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SOURCE	ACCESSION NUMBER	TOTAL
C. OTHER		
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Commonwealth Scientific and Industrial Research Organization, Australia	W75-10643--10649	7
Effects of Pollutants on Aquatic Life (Katz)	W75-10408--10413 10415--10420 10422--10439 10441--10451 10609--10630 10696--10704 10844	73
Forest Service (USDA)	W75-10650--10657 10659--10660 10692--10693 10695	13
Ocean Engineering Information Service (Patents)	W75-10725--10738 10845	15
U. S. Geological Survey	W75-10580--10582 10584--10606	26
Vanderbilt University, Metals Pollution	W75-10476--10485 10487 10489--10495 10497--10501	23

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- Ground and surface water hydrology at the Illinois State Water Survey and the Water Resources Division of the U.S. Geological Survey, U.S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

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- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

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4 WATER QUANTITY MANAGEMENT AND CONTROL

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6 WATER RESOURCES PLANNING

7 RESOURCES DATA

8 ENGINEERING WORKS

9 MANPOWER, GRANTS, AND FACILITIES

0 SCIENTIFIC AND TECHNICAL INFORMATION

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AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

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